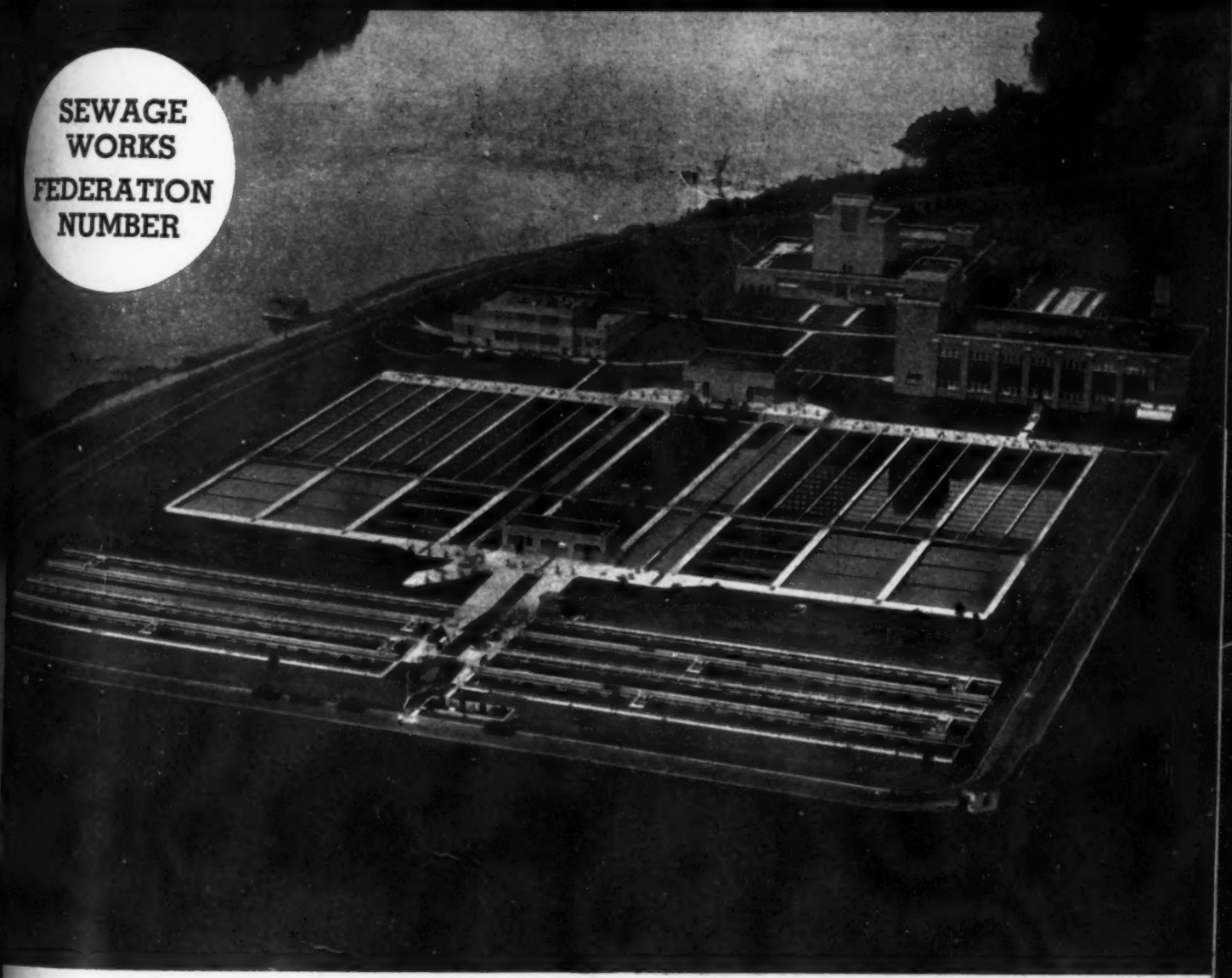
WATER WORKS & SEWERAGE

SEWAGE WORKS FEDERATION NUMBER



THE MINNEAPOLIS-SAINT PAUL SEWAGE TREATMENT PLANT

(World's Largest Chemical Treatment Plant)

CHAPMAN'S TILTING DISC Comes to Rest Like a Flock of Feathers

When flow slows down, this unique check valve's only moving part . . . the balanced, hinge-pinned disc . . . is cushioned gently to a silent seat. No jarring or surging. No burst pipe joints. And practically no wear at all in the valve itself . . . which means that it will last indefinitely, without even any need for maintenance.

Head loss is reduced 65% to 80% over conventional type checks, and pumping costs are slashed as much as $95.00 per valve per year. On every count, Chapman's Tilting Disc is the check valve to specify for *your* operations, for it will not only see you through for the duration, but will continue to keep your costs down through many postwar years. Write for the whole story *right now*.

The Chapman Valve Mfg. Co., Indian Orchard, Mass.

CHAPMAN NON-SLAM CUSHIONED CLOSING **CHECK VALVES**

WATER WORKS & SEWERAGE, October, 1943. Volume 90, Number 10. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under act of March 3, 1879.

IS PERFORMING DISTINGUISHED SERVICE

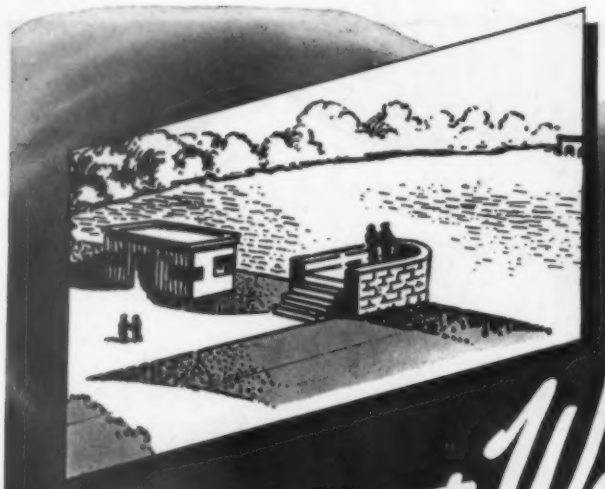
If ever a chemical deserved a military medal, it's chlorine! It is always with the advance spearhead of attack . . . Its compounds land with the first invasion troops . . . Serving on duty everywhere in the field during every campaign — fighting the battle against water-borne disease.

Chlorine and its compounds serve both the army and the navy from the time a man enters the service until he's mustered out.

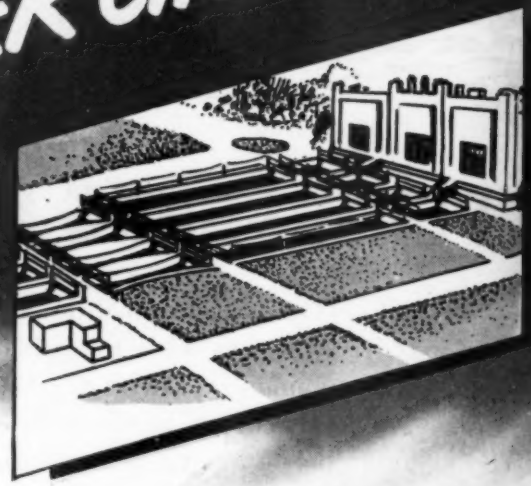
Chlorine's most important function is the protection of drinking water. But it's also used by the medical corps as a bactericide. It's a bleach and sanitizing agent in camp laundries. And, in footbaths it guards against common infections.

All this is vitally important — and to this service Penn Salt devotes a large percentage of its output of chlorine and chlorine compounds. With facilities expanded and service augmented by this wartime experience, Penn Salt is now equipped to serve you better when peace returns.

Perchloron
REG. U.S. PAT. OFF.



Important Water System Jobs SAFE WITH HOOKER CHEMICALS



Few chemists and engineers have a greater responsibility than those in charge of waterworks. They supervise water purification, slime control, sewage treatment. Upon their administration of these essential services, depend public health in the abstract, human lives in the concrete.

Fortunately past experience is available as a guide. These three important jobs have long been entrusted to Hooker Chemicals by municipalities and private utilities from coast to coast. The continued use of Hooker products in this service is evidence of the high quality of Hooker Chemicals.

Specific HOOKER products serve as follows: for *sewage treatment* — bleaching powder, liquid chlorine and ferric chloride solution; for *water purification* and *slime control*— bleaching powder and liquid chlorine.

Write for a complete list of principal HOOKER chemicals, giving you at a glance the data you need on formulas, specifications, uses and shipping containers. Ask for list W-10.

BACK THE ATTACK
BUY WAR BONDS

HOOKER ELECTROCHEMICAL COMPANY
NIAGARA FALLS, N. Y.
New York, N. Y. • Tacoma, Wash. • Wilmington, Calif.

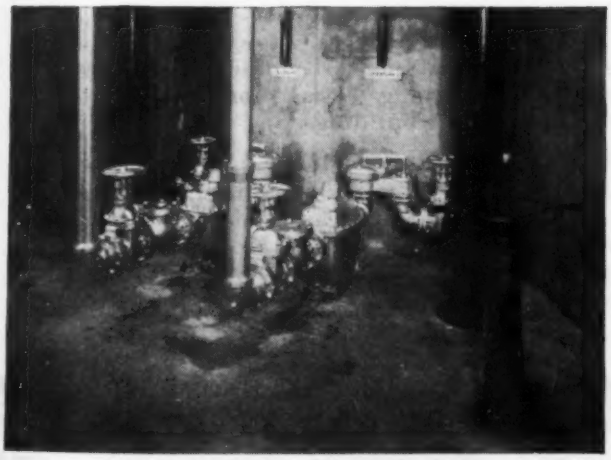
HOOKER CHEMICALS

4823

In THE PAPILLION CREEK SEWAGE TREATMENT PLANT

Omaha, Neb.

EMCO No. 4 Sewage Gas Meter measuring gas consumed by Digester Heating Facilities



EMCO No. 2½ Sewage Gas Meters measuring portion of daily gas production at Omaha. In foreground, two floor stands for operating gear driven Nordstrom Valves on sludge lines.

ACCURATE, DEPENDABLE, TROUBLE FREE
METERS AND VALVES
PROVIDE EXACTING CONTROL

THE Papillion Creek District Sewage Treatment Plant in Omaha, Nebraska, a model of its kind, is one of the finest in the Midwest. It is designed to serve an area embracing 60,000 people, with expansion facilities for serving an ultimate population of 100,000.

Designed under the supervision of the late George B. Gascoigne and the successor organization of Havens and Emerson, this plant is equipped with the latest and most modern operating and control apparatus.

The plant uses fifty-three Nordstrom Lubricated Plug Valves for controlling air to the channels and sludge to and from the digestion units. For the measurement of hot water, four 1½-inch Pittsburgh Hot Water Meters are used; and for sewage gas measurement the plant employs four EMCO No. 2½ and two EMCO No. 4 Sewage Gas Meters.

PITTSBURGH EQUITABLE METER COMPANY

BOSTON BROOKLYN BUFFALO CHICAGO COLUMBIA HOUSTON KANSAS CITY

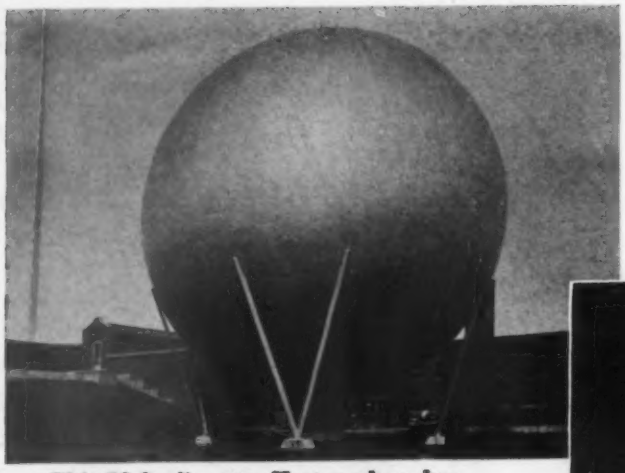
MERCO NORDSTROM VALVE COMPANY
Main Offices, Pittsburgh, Pa.
NATIONAL METER DIVISION, Brooklyn, N. Y.

LOS ANGELES MEMPHIS NEW YORK PITTSBURGH SAN FRANCISCO SEATTLE TULSA

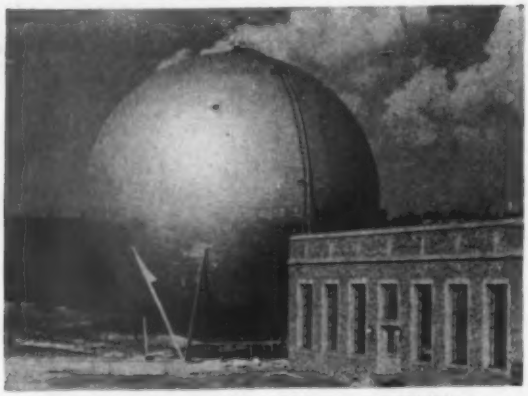
INVEST TODAY IN BONDS FOR VICTORY

PITTSBURGH-NATIONAL WATER METERS • EMCO SEWAGE GAS METERS • NORDSTROM LUBRICATED VALVES

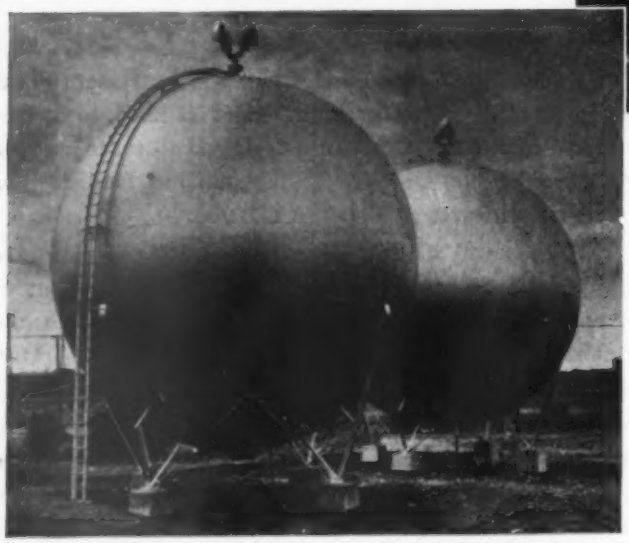
HORTONSPHERES
prove sound investments at disposal plants



This 50-ft. diameter Hortonsphere has been in service at the Green Bay, Wis., sewage disposal plant since 1937.



Hortonspheres are used at two of Cleveland's three disposal plants. This 57½-ft. diameter unit is at the Southerly plant.



The two 36-ft. diameter Hortonspheres directly above are at the Rock Island, Ill., plant. A similar sized one at Springfield, Mass., appears above at the right.

THE utilization of gas produced in the digestion chambers at sewage disposal plants has always paid dividends. Disposal plants whose facilities for using this gas include Hortonspheres, are able to maintain a constant supply of gas for many purposes. At some plants, the gas is burned as fuel in engines, to generate power for pumping sewage or to heat the digesters or plant buildings.

When there is an abundant supply of gas being produced in the digesters, it may be stored in these high-pressure gas holders for future use, thereby enabling engines or burners to operate continuously or intermittently without expensive standby equipment or purchased fuel.

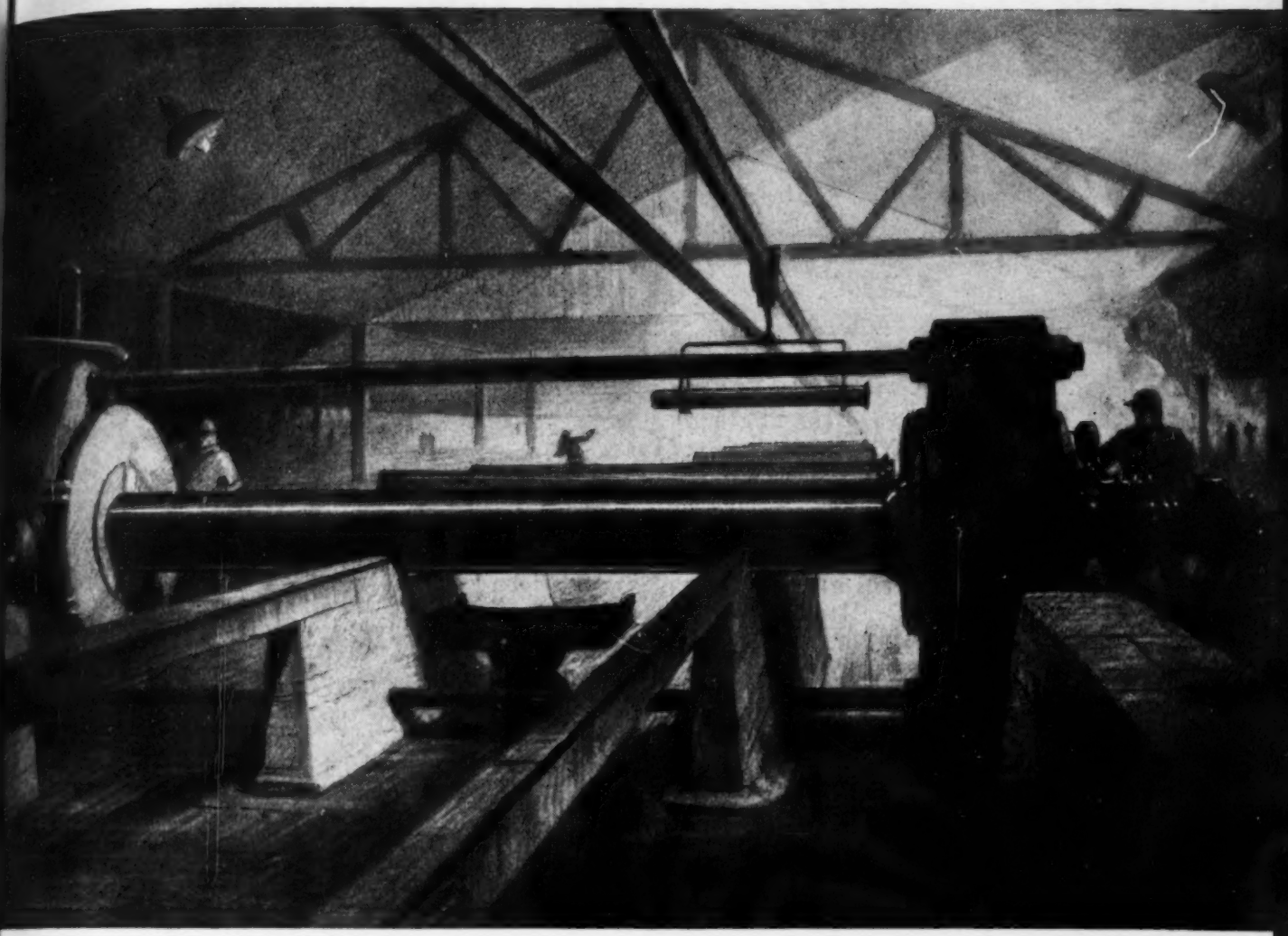
ARMY E NAVY

. . . Awarded to our shipyard at Seneca, Ill., and dry dock yards at Eureka, Calif., and Newburgh, N. Y.

CHICAGO BRIDGE & IRON COMPANY

Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2282 Guildhall Bldg.
Havana.....402 Edificio Abreu
Birmingham 1.....1586 North 50th Street
Tulsa 3.....1646 Hunt Bldg.
Houston 1.....5615 Clinton Drive
Philadelphia 3.....1644-1700 Walnut St.
Washington 5.....330 Bowen Bldg.
San Francisco 5.....1083 Rialto Bldg.

Final Assurance

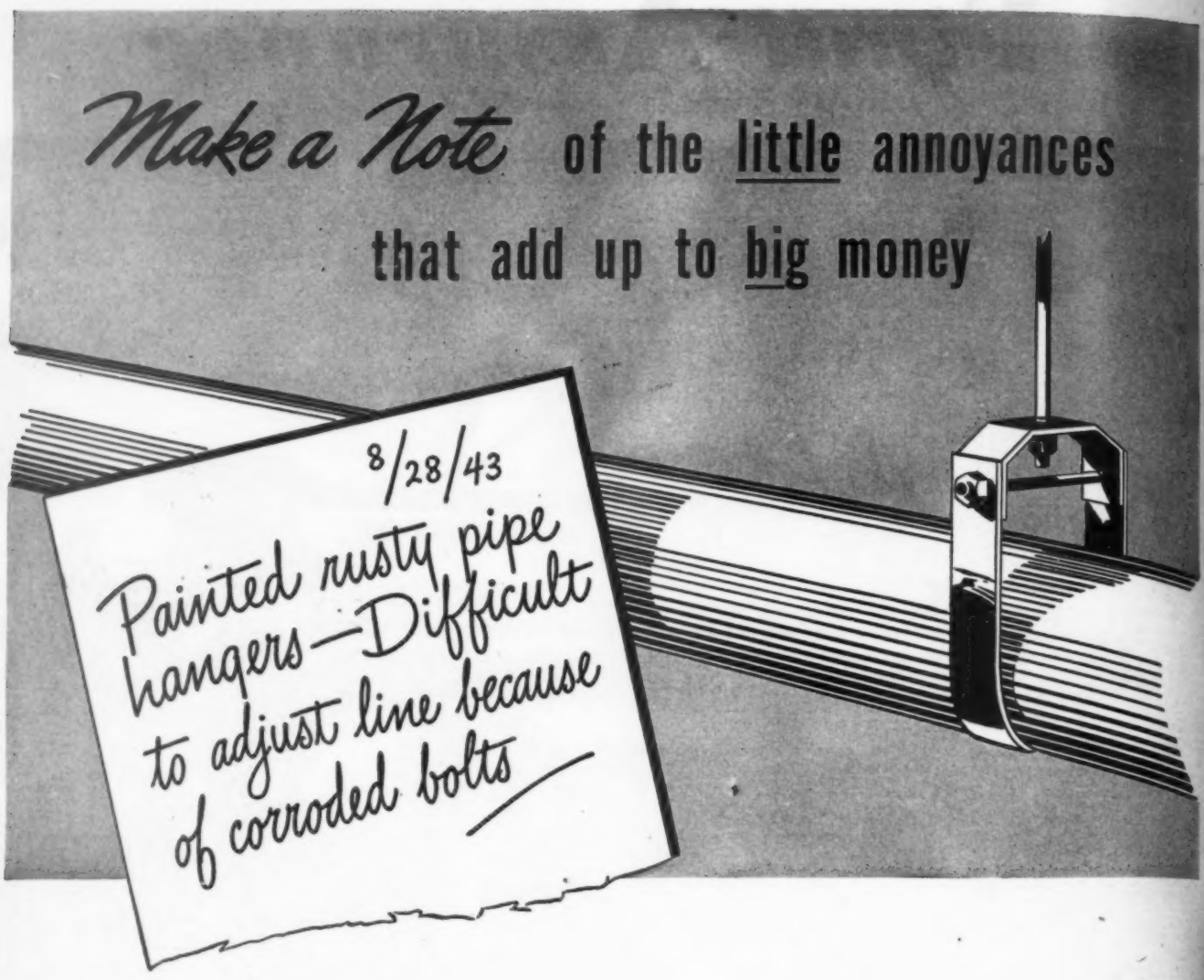


The Hydrostatic Test, drawn by Hugh Ferriss.

The final test of the cast iron pipe you buy from us–one of a long series of quality controls –is the Hydrostatic Test. Every full length of pipe–whether for water, gas, sewerage or industrial service – is subjected to a hydrostatic pressure test before shipment. The test pressure used is at least twice the rated working pressure. The storage yards of our several plants are amply stocked with U. S. Super-de Lavaud centrifugally cast pipe ready for immediate shipment.

UNITED STATES PIPE & FOUNDRY CO.

General Offices: Burlington, New Jersey. ***Plants and Sales Offices throughout the U. S. A.***


Make a Note of the little annoyances
that add up to big money
8/28/43
Painted rusty pipe hangers—Difficult to adjust line because of corroded bolts

They're routine jobs for your maintenance men; often, you don't even get a report on them. But it takes a lot of paint to keep rust under cover. And materials that have to be replaced regardless of your care, and the labor required, all add up to real money in a year's time.

If you had used aluminum parts and fittings wherever feasible, you'd be spared a lot of those annoyances and expenses. Of course, you can't replace them with aluminum now—aluminum is going 100% into war work—but make some notes for post-war reference. Plan on using aluminum for the little jobs as well as the big ones.

Aluminum will be available in every form after the war. Manufacturers and workmen are accustomed to working with it. So, when you say, "Make those pipe hangers of Alcoa Aluminum," you'll get your favorite product made of aluminum; nonrusting, strong, light in weight, good looking. Then you'll see your maintenance costs dropping off.

ALUMINUM COMPANY OF AMERICA, 1955 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA **ALUMINUM**

WATERWORKS AND SEWAGE ENGINEERS EVERYWHERE RELY ON THE UNFAILING PURITY AND UNIFORMITY OF

Diamond Liquid Chlorine

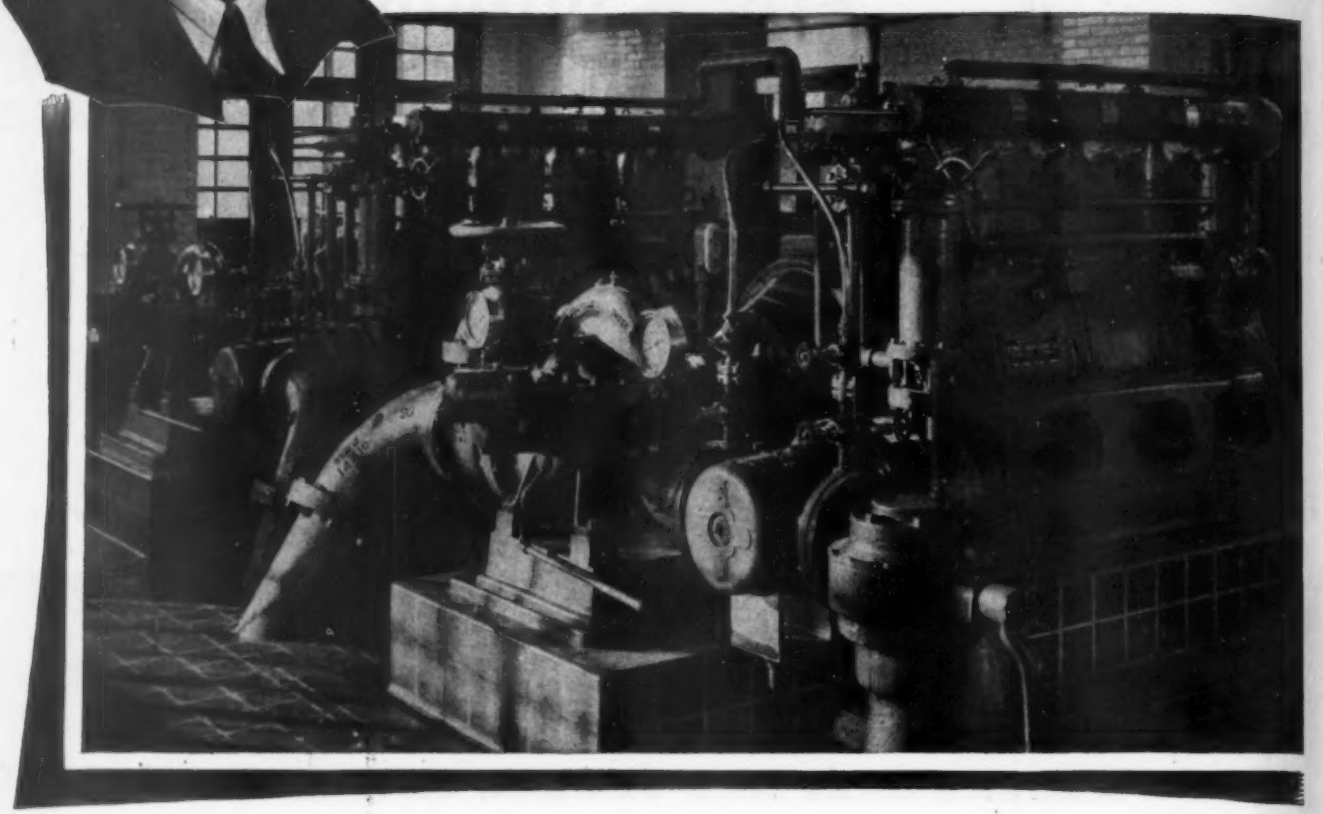
Always uniform, dependable, pure—Diamond Liquid Chlorine comes to you in individual cylinders, multi-unit or single-unit tank cars, whichever best suits your requirements.

DIAMOND ALKALI COMPANY

PITTSBURGH, PA. AND EVERYWHERE

Mr. Duy writes us about the

CLIMAX ENGINES AT AURORA WATERWORKS



"No Maintenance Costs... Dependable... Satisfactory"

Aurora, Illinois, August 27, 1943

"We are writing to give you information concerning the operating experience we have had with your gas engines.

"In our main plant we have 2 Climax R81 200 h.p. engines. Each is directly connected to 4 million gallon a day horizontal booster pumps which we use for standby service. These engines operate at 1450 r.p.m. on 800 b.t.u. gas. The engines were installed in 1936 and have been in service ever since.

"For the past two years, since the writer has been in charge of the plant, we have had no maintenance cost, and they are operating on a regular schedule. We find them very dependable and satisfactory for the service."

Very truly yours,
WATER AND LIGHT DEPARTMENT

Carl Duy
Engineer of Water Works

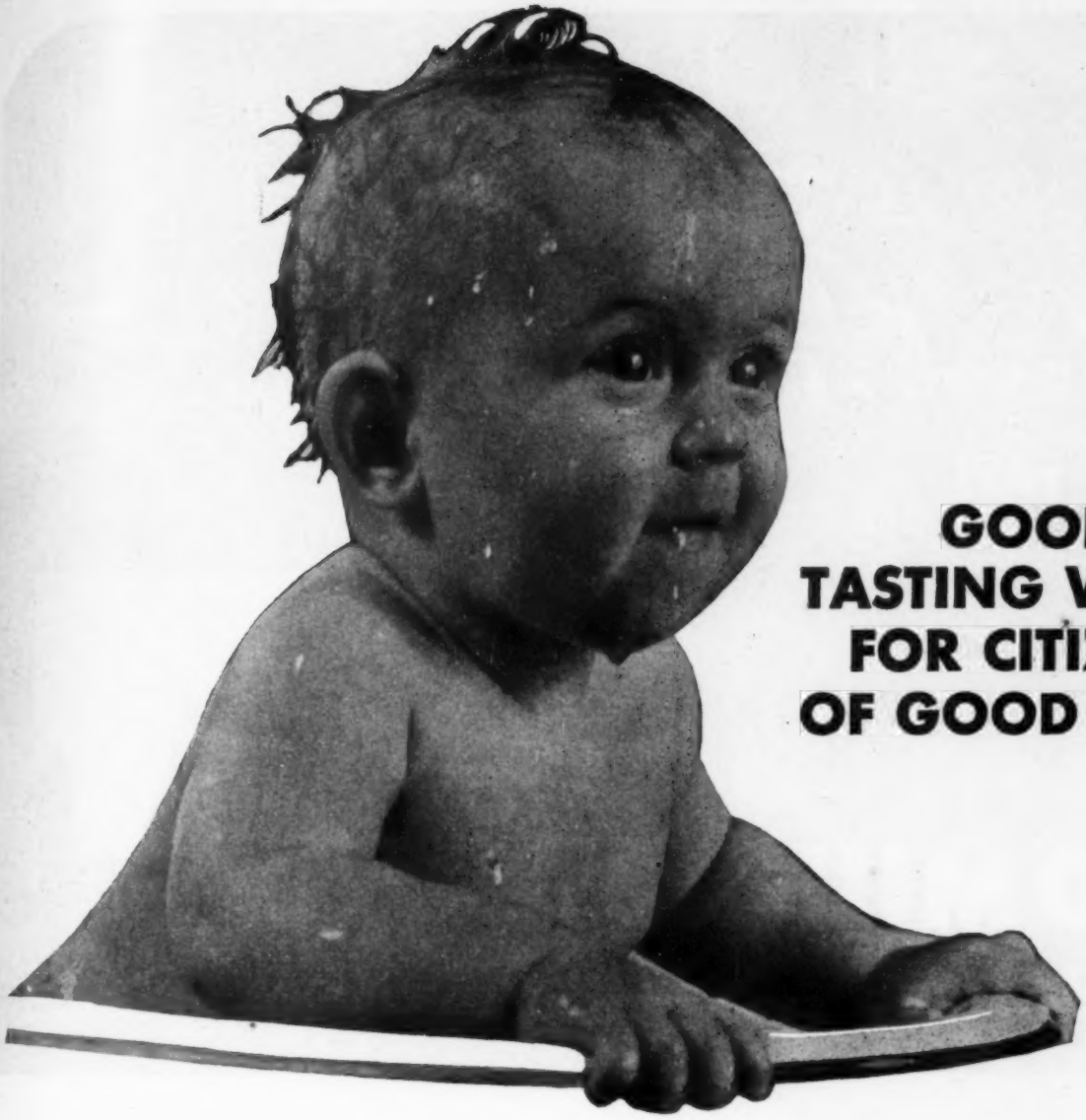
You, too, can secure equally good results from the use of one or more of the many sized Climax engines available. At present, priorities are required to install new plants or improve old ones. However, in the sewage field 3 plants recently obtained priorities for these engines.

SEND FOR BULLETINS
Each covers a single Climax—uses, ratings, design, construction and specifications.

"For High Achievement in the Production of War Material"

ARMY E NAVY

Climax
Engineering Company
GENERAL OFFICES & FACTORY
CLINTON, IOWA
REGIONAL OFFICES: CHICAGO, ILL., DALLAS, TEXAS



GOOD TASTING WATER FOR CITIZENS OF GOOD TASTE

WATER WORKS SUPERINTENDENTS know the value of supplying odor-free water, not alone for drinking but also for bathing purposes. That is why they use Aqua Nuchar Activated Carbon to remove taste and odor producing substances.

Most tastes and odors normally present in surface water supplies can be removed by Aqua Nuchar Activated Carbon—and at a very minor annual per capita cost.

The fall rains will flush out swampy areas where stagnant water has an opportunity to leach out the color from vegetation during the summer months. This contributes heavily to your color removal problem and to the accompanying taste. Its solution lies in the application of increased coagulation dosage for color removal and AQUA NUCHAR for taste and odor removal.

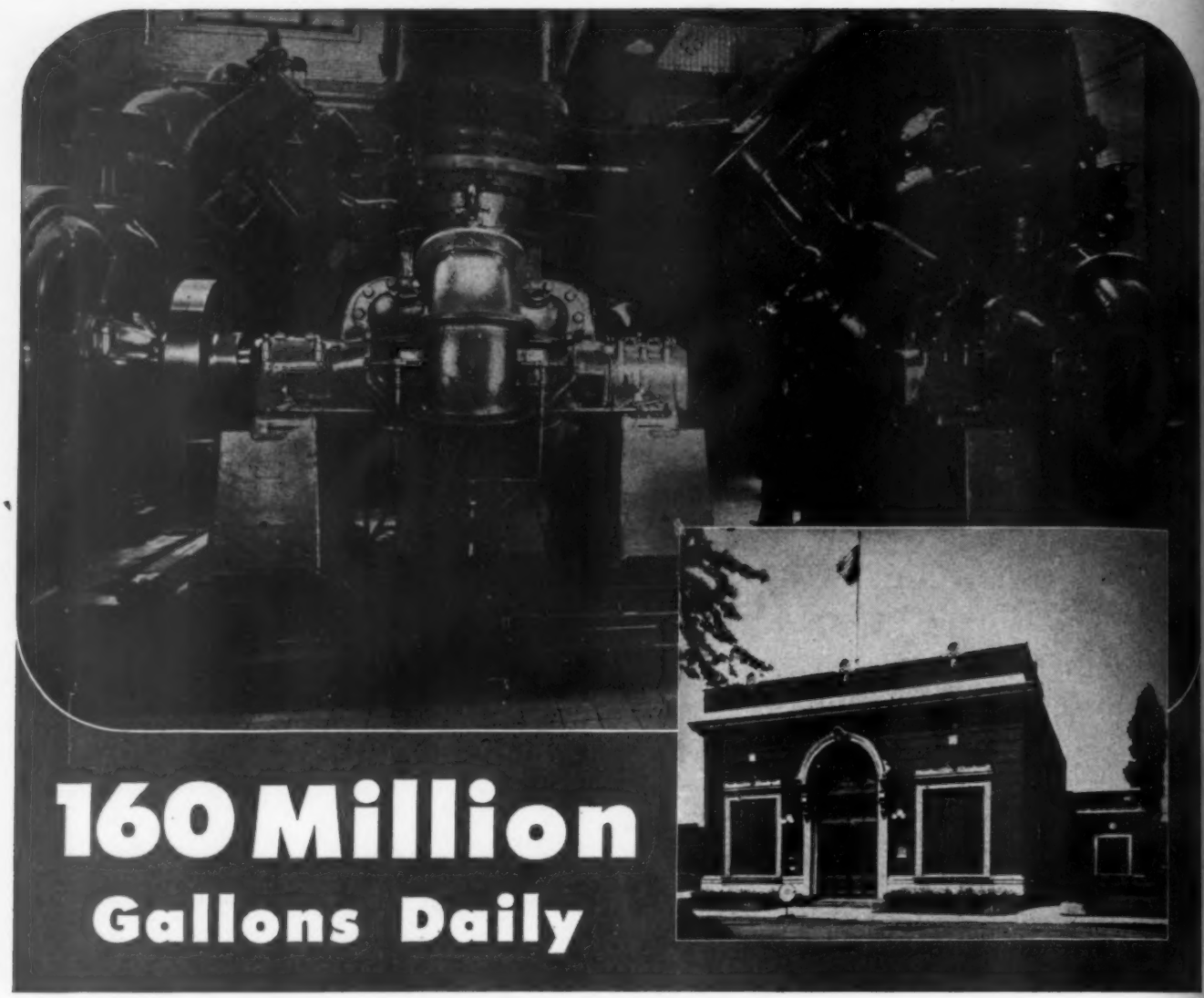
Keep a good supply of Aqua Nuchar Activated Carbon on hand. It is your guarantee against taste and odor problems that arise suddenly.

NUCHAR AQUA

INDUSTRIAL CHEMICAL SALES

DIVISION WEST VIRGINIA PULP & PAPER COMPANY

230 PARK AVENUE, NEW YORK 17, N.Y. | 35 E. WACKER DRIVE, CHICAGO 1, ILLINOIS | 748 PUBLIC LEDGER BLDG., PHILADELPHIA 6, PA. | 844 LEADER BLDG., CLEVELAND 14, OHIO



160 Million Gallons Daily

Thomas Jefferson Pumping Station
uses four Fairbanks-Morse thirty-inch, double-suction pumps

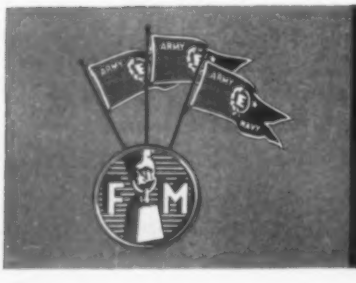
A group of four Fairbanks-Morse thirty-inch, double-suction, single-stage, split-case pumps gives the Thomas Jefferson Pumping Station in Chicago a total capacity of 160,000,000 gallons of water daily. Installation of these pumps departs from the conventional in that suction is horizontal and discharge is vertical. Water is taken from Lake Michigan at the Wilson Avenue Crib, brought through five miles of tunnel and discharged through twenty-three miles of feeder mains. Each of these big pumps is driven by a 1200 hp. motor.

Modern pumping equipment such as is found at the Thomas Jefferson Pumping Station, saves the taxpayers of any municipality real money. In many cases, old pumps, even if as good as when installed, exact at least a 10% power cost penalty. At that rate, new pumps soon pay for themselves.

Comparatively few cities require pumps with such large capacity as Chicago; but large or small, Fairbanks-Morse builds the right pump for the job.

Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago, Illinois.

BUY WAR BONDS

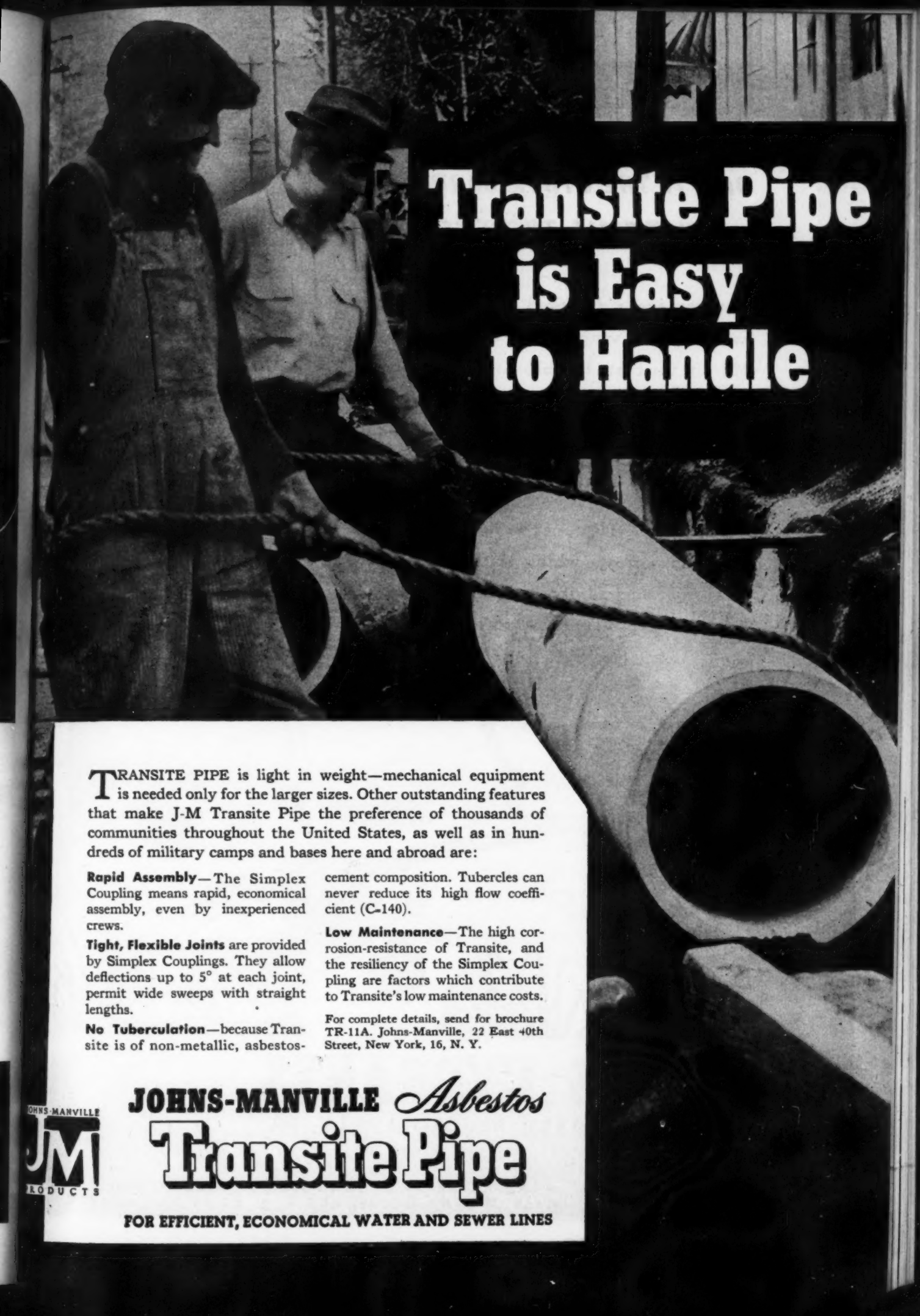


FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

F M

Pumps



Transite Pipe is Easy to Handle

TRANSITE PIPE is light in weight—mechanical equipment is needed only for the larger sizes. Other outstanding features that make J-M Transite Pipe the preference of thousands of communities throughout the United States, as well as in hundreds of military camps and bases here and abroad are:

Rapid Assembly—The Simplex Coupling means rapid, economical assembly, even by inexperienced crews.

Tight, Flexible Joints are provided by Simplex Couplings. They allow deflections up to 5° at each joint, permit wide sweeps with straight lengths.

No Tuberculation—because Transite is of non-metallic, asbestos-cement composition. Tubercles can never reduce its high flow coefficient (C-140).

Low Maintenance—The high corrosion-resistance of Transite, and the resiliency of the Simplex Coupling are factors which contribute to Transite's low maintenance costs.

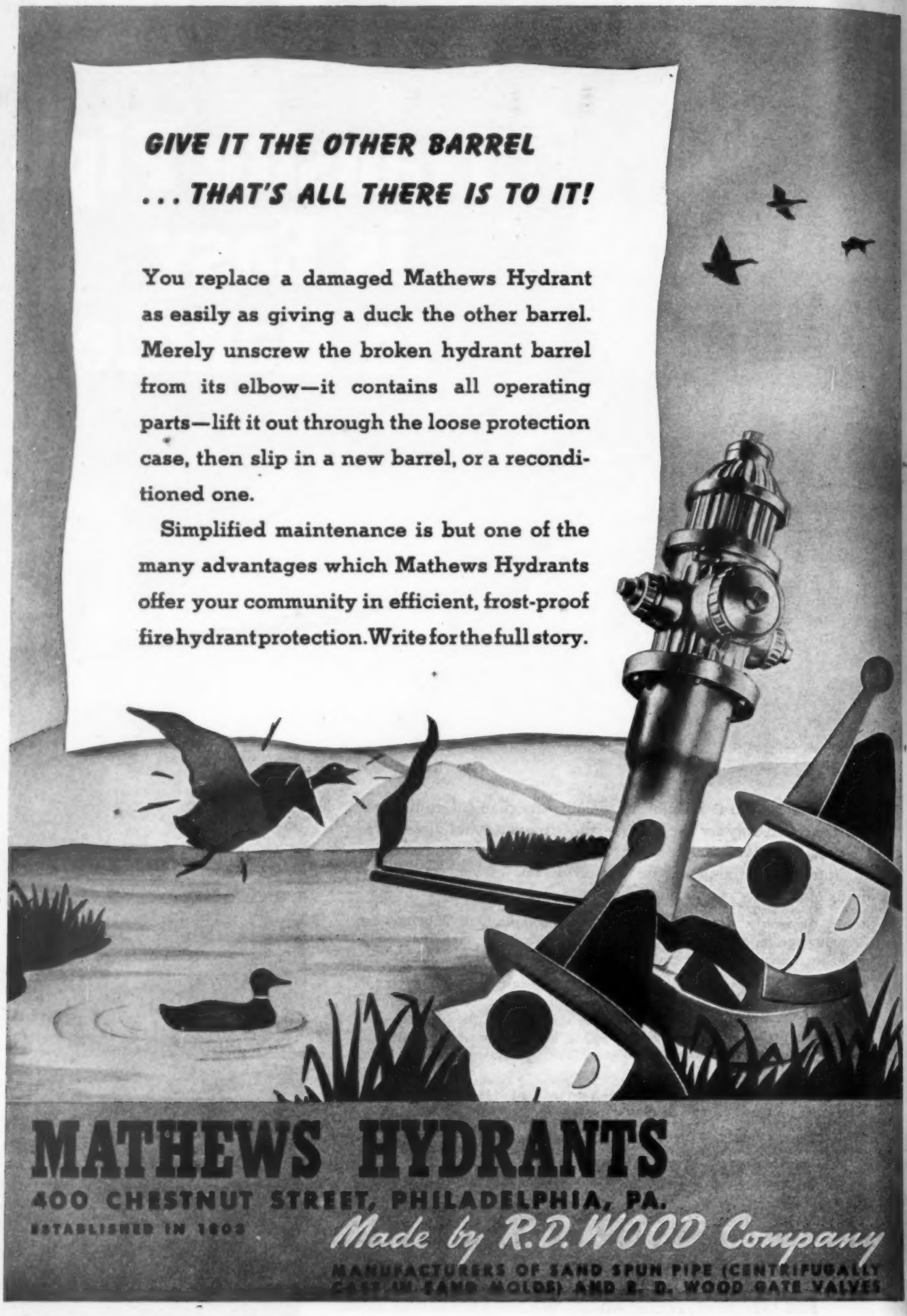
For complete details, send for brochure TR-11A. Johns-Manville, 22 East 40th Street, New York, 16, N. Y.

JOHNS-MANVILLE PRODUCTS

JOHNS-MANVILLE *Asbestos*

Transite Pipe

FOR EFFICIENT, ECONOMICAL WATER AND SEWER LINES


GIVE IT THE OTHER BARREL
... THAT'S ALL THERE IS TO IT!
You replace a damaged Mathews Hydrant as easily as giving a duck the other barrel. Merely unscrew the broken hydrant barrel from its elbow—it contains all operating parts—lift it out through the loose protection case, then slip in a new barrel, or a reconditioned one.
Simplified maintenance is but one of the many advantages which Mathews Hydrants offer your community in efficient, frost-proof fire hydrant protection. Write for the full story.
MATHEWS HYDRANTS
400 CHESTNUT STREET, PHILADELPHIA, PA.
ESTABLISHED IN 1803
Made by R.D. WOOD Company
MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

Now Badgers Are Proving Their **Ruggedness**

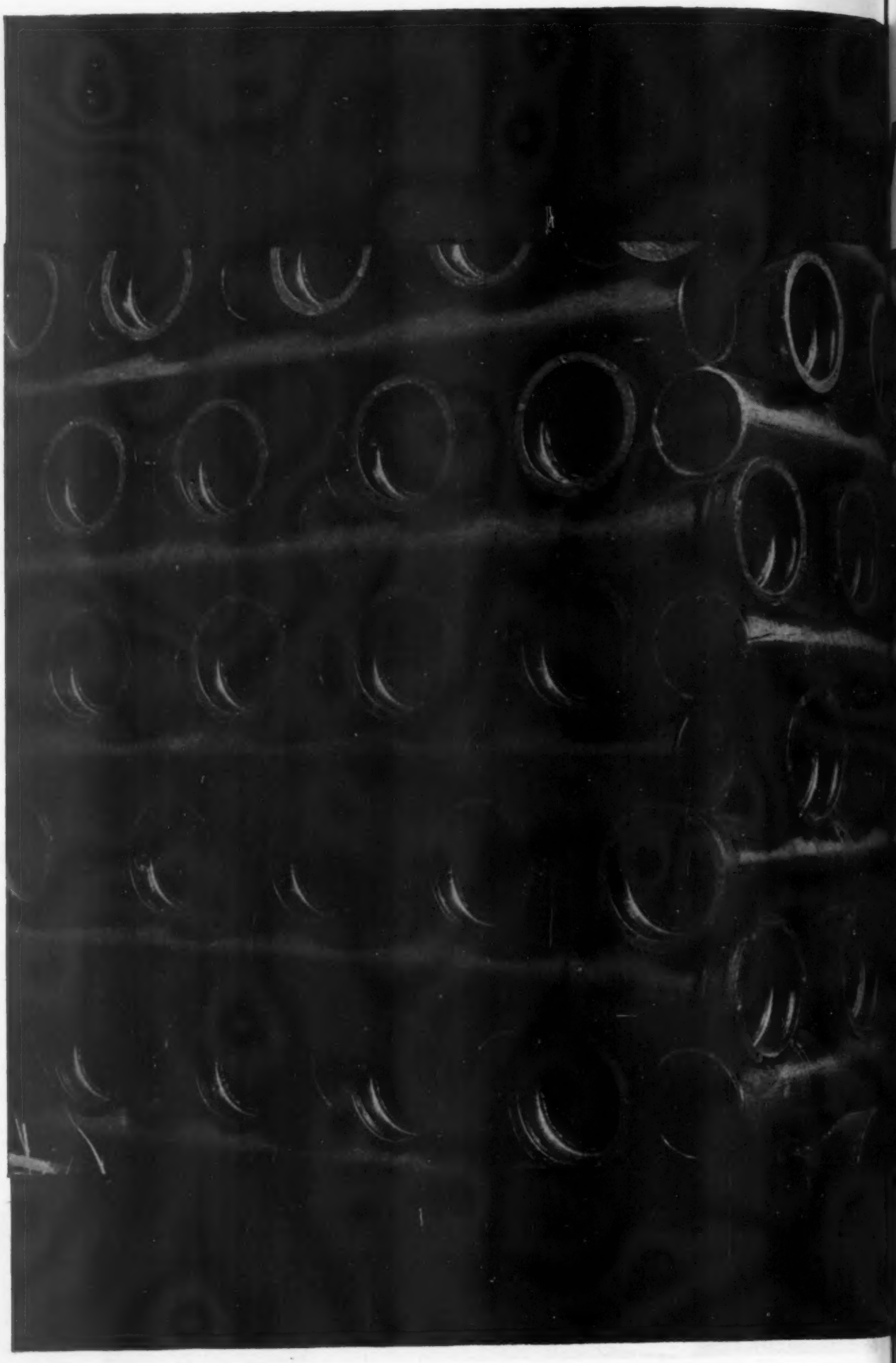
Sound engineering, durable construction, lasting dependability, designed and built into Badger water meters for 38 years, are proving their value today. These qualities are reflected in longer life, sustained accuracy, less need for repair and replacement and lower maintenance cost.

For 38 years Badger has stood for the finest materials, craftsmanship and presicion manufacture. Communities that invested in Badgers have proved the wisdom of their selection by the trouble-free service their Badger water meters have given. The Badger organization is prepared to help you with conservation of water meters — now a patriotic duty. Whether your problem is one of maintenance, repair or replacement, feel free to call on us.

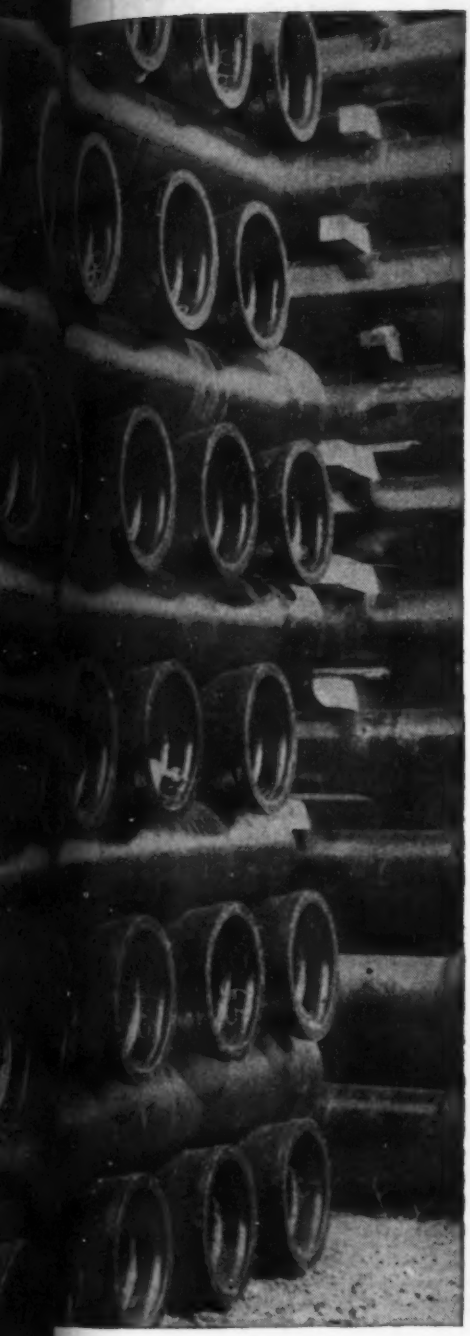
BADGER METER MFG. CO.
MILWAUKEE, WISCONSIN

BRANCH OFFICES: New York City • Waco, Texas • Tampa, Fla. • Chicago, Ill. • Kansas City, Mo. • Savannah, Ga. • Marshalltown, Iowa • Seattle, Wash. • Los Angeles, Calif. • Philadelphia, Pa.

Representing recognition by the Army and Navy of especially meritorious production of war materials.



ready for SHIPMENT!



For essential maintenance and improvements, you can get cast iron pipe quickly from any of the members of the Cast Iron Pipe Research Association. Plant storage yards are amply stocked with pipe and standard fittings in commonly wanted sizes and types. Special requirements can be quickly produced. Cast iron pressure pipe production facilities have necessarily been maintained intact since Pearl Harbor because of the vast amount of cast iron pipe required for war construction, now largely completed.

Thriftier than ever

You can now get cast iron pipe made in accordance with the new A.S.A. Law of Design. This means pipe scientifically correct as to weights and dimensions for your specific service conditions. This Law of Design is sponsored by official organizations of pipe users and has been approved by the American Standards Association. Cast iron pipe so produced is more economical than ever.

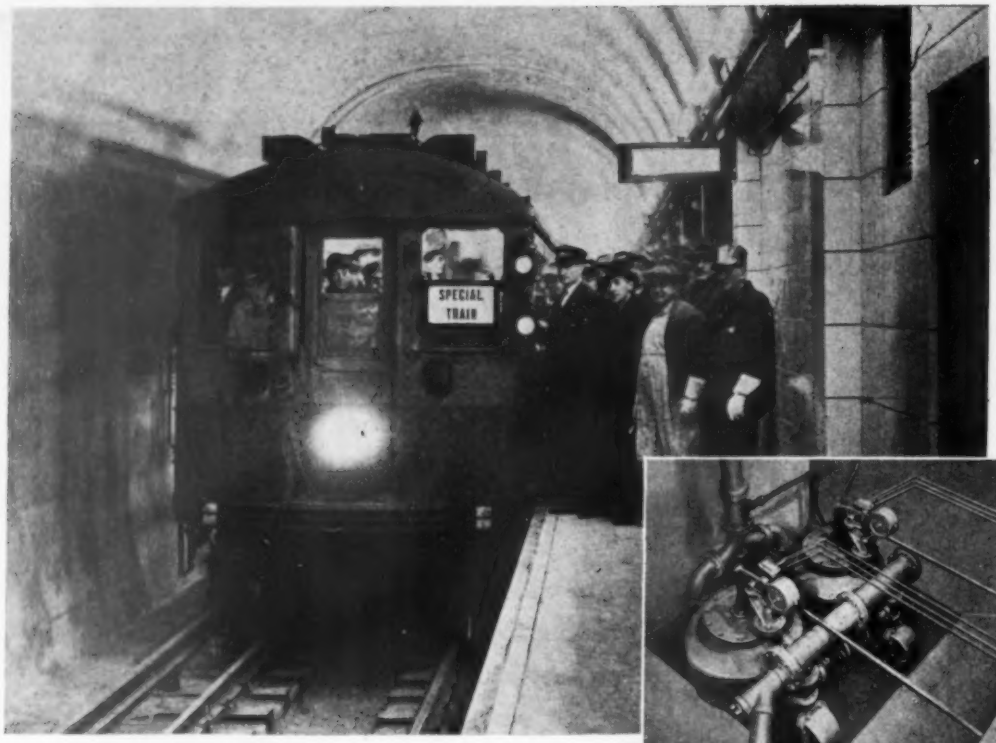
Postwar Planning

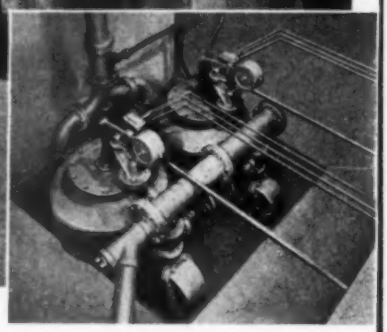
One material you can safely specify for prompt delivery after the War is cast iron pipe. And the essence of the need for postwar planning is detailed plans in blueprint form, ready for proposals, so the work can start when the last shell is fired.

RESEARCH ASSOCIATION, CHICAGO

CAST IRON

NO. 1 TAX SAVER

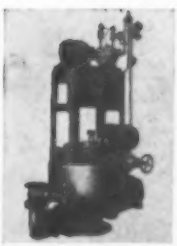




CHICAGO'S SUBWAY IS YEOMANS EQUIPPED ★

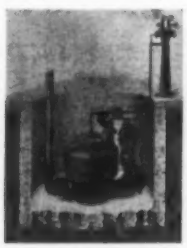
There's no better evidence that Chicago's Subway is the last word in modern efficiency than the Yeomans Shone-Type Pneumatic Sewage Ejectors serving the underground stations . . . To this job, these Yeomans units bring a record of 75 years of extraordinary service, handling unscreened sewage in municipal lift stations, and installations of every kind throughout the world . . . At each of the thirteen State Street stations is a 50-gallon duplex installation of Yeomans Shone "SDV" Ejectors, each capable of pumping 100 gallons per minute of unscreened sewage against a 25-foot head . . . With no screens or shredders, no wet well, no danger of gas explosions, these sturdy efficient units are "good news" to maintenance men . . . At each station compressed air for operation is provided by a Yeomans Air-Cooled Rotary Air Compressor near the pit.

There's a type of Yeomans Shone equipment to fit your requirements. Write for Bulletin.

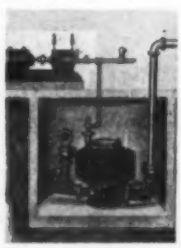


"Package" Type Pneumatic Ejector—completely self-contained unit, with built-in automatic control and compressor. Bulletin 4301.

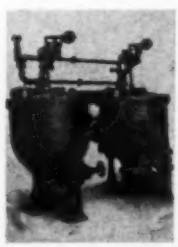
"Expelsor"—pneumatic ejector designed for systems where flows are too small for centrifugal pumps. No screening. Bulletin 4401.



"SDV" Type Ejector—convenient, accessible, commonly recommended for municipal and city building application. Bulletin 4003.



"SEC" Type—a counterpart of the "Package" Type Pneumatic Ejector but with the compressor separately mounted. Bulletin 4301.



Duplex "SDV" Type—as used at Chicago Subway State Street stations; Shone efficiency with double capacity. Bulletin 4003.

A Partial List of Yeomans Shone Municipal Installations

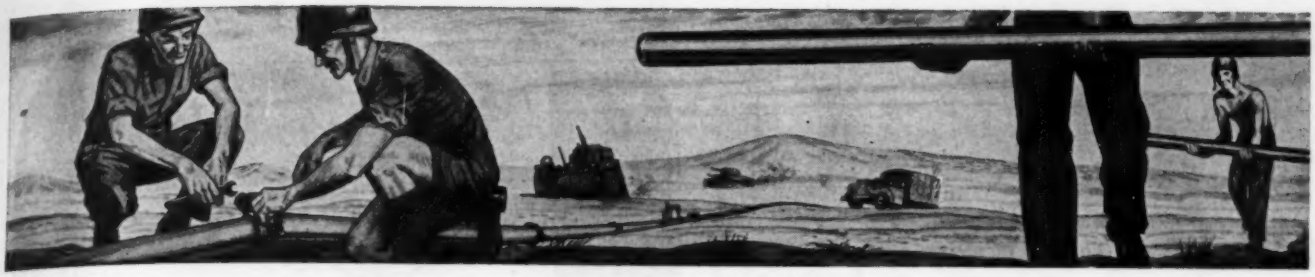
★

Dinuba, Calif. (3)
Wilmington, Del. (3)
Daytona, Fla.
Fort Lauderdale, Fla. (10)
Silver Springs, Fla.
Grant Park, Chicago
Sanitary Dist. of Chicago
Warsaw, Indiana
Cedar Rapids, Iowa
Charles City, Iowa
Davenport, Iowa
Sioux City, Iowa
Lawrence, Kansas (3)
Salina, Kansas (3)
McPherson, Kansas
Richmond, Ky.
Lynn, Mass.
Detroit, Mich.
Flint, Mich.
Muskegon, Mich.
St. Joseph, Mich.
Albert Lea, Minn. (4)
Faribault, Minn.
Rolla, Mo.
Bloomfield, Neb.
Elizabeth, N. J.
Batavia, N. Y.
Lyons, N. Y.
Rochester, N. Y.
Barberton, Ohio (10)
Cleveland, Ohio
Dayton, Ohio (4)
Elyria, Ohio
Huron, Ohio
Lima, Ohio
Massilon, Ohio
Painesville, Ohio (3)
Vermillion, Ohio
Enid, Okla.
Butler, Pa.
Meadville, Pa. (4)
Newcastle, Pa.
Lancaster, Pa.
Philadelphia, Pa.
Providence, R. I.
Austin, Texas (4)
Dallas, Texas
Portsmouth, Va. (10)
Fond du Lac, Wis.
Menasha, Wis.
Milwaukee, Wis. (8)
Portage, Wis.

YEOMANS PUMPS
GIVE YEOMAN SERVICE

Yeomans Brothers Company

1423 NORTH DAYTON STREET • CHICAGO 22, ILLINOIS



BLITZ PIPELINES

One of the potent weapons in the Allied blitz campaigns in North Africa and Sicily turned out to be Victaulic coupled portable pipelines that could be laid by unskilled or regular Army personnel at the rate of 10 to 30 miles a day so oil, gasoline, or water could keep pace with swiftly advancing troops. Specially designed pipe, grooved for Self-Aligning Victaulic Couplings, was used. Victaulic is the fastest known way of coupling pipe . . . and Victaulic gives you all these other basic advantages . . .

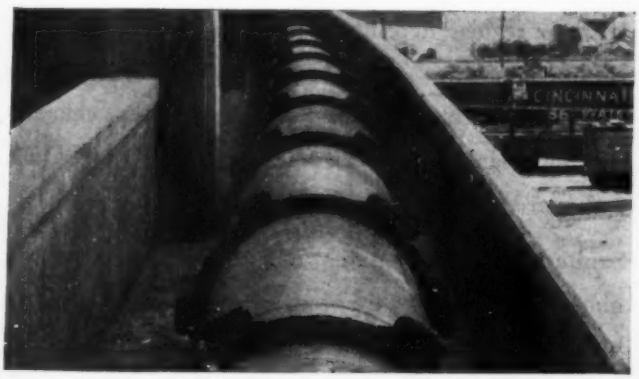
1 Fast, Self-Aligning permits angular deflection!

2 Leak-tight, self-sealing under pressure or vacuum!

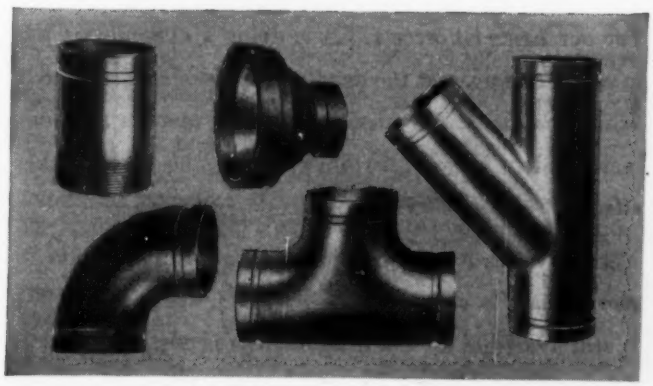
3 Positive mechanical lock of pipe lengths!

4 Every joint is a pipe union!

5 Every joint an expansion joint!



SAVES MONEY IN INSTALLATION AND MAINTENANCE! For 20 years Victaulic Couplings have been specified by Municipal Engineers for power plants, water storage and supply, gas, sewerage, fire protection, emergency line and other pipe installations. Unskilled labor can handle the installation. Only a small wrench is needed. Maintenance is nil.



VICTAULIC FULL-FLOW FITTINGS! A new line of redesigned pipe fittings to eliminate undue frictional losses! Engineered with long easy sweeps to reduce the possibility of clogging to an absolute minimum. A real contribution to greater efficiency in conducting fluids and gases in pipe systems.

MUNICIPAL

VICTAULIC

SELF-ALIGNING PIPE COUPLINGS AND FULL-FLOW FITTINGS

Available soon for your permanent files . . . a new easy-to-use Victaulic Catalog and Engineering Manual. Reserve your copy now!

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*Firm*_____

*Address*_____

Mail to nearest address: VICTAULIC COMPANY OF AMERICA, 30 Rockefeller Plaza, New York 20, N. Y.; Victaulic Inc., Los Angeles 14, California; Victaulic Co. of Canada, Ltd., Toronto. 1-H

The Man Behind the Man Behind the Gun Needs Protection, too!

For our Armed Forces HTH is doing a magnificent job in protecting against the deadly menace of contaminated drinking water . . . in sterilizing eating utensils . . . and, incidentally, in safeguarding against the disagreeable effects of athlete's foot.

Yet the necessity for providing adequate protection to our civilians is also vital. To that end, Mathieson HTH is still available for essential civilian needs.

Hundreds of communities throughout the nation use HTH for regular, dependable protection . . . and for quick aid in emergencies. Take the case of a burst water main —it can happen any time—any place. Prompt chlorination with Sanitation HTH, following repairs, saves time and guards against pollution.

Sanitation HTH contains 70% available chlorine, is quick-acting, easy to use, easy to transport, easily soluble. Write today for full information and your nearest source of supply.

MATHIESON Sanitation HTH

ARMY NAVY

THE MATHIESON ALKALI WORKS (INC.), 60 EAST 42nd STREET, NEW YORK, N. Y.

LIQUID CHLORINE . . . SANITATION HTH . . . HTH BLEACH . . . SODA ASH . . . CAUSTIC SODA . . . BICARBONATE OF SODA . . . AMMONIA, ANHYDROUS and AQUA . . . PH-PLUS (FUSED ALKALI) . . . DRY ICE . . . CARBONIC GAS . . . SYNTHETIC SALT CAKE . . . SODIUM CHLORITE PRODUCTS

. Interested in War-Time Operation and Maintenance - - - Present and Post-war Sewage Projects

Carrying out the spirit of the War-time Convention of the Federation of Sewage Works Associations, October 21-23, Hotel Sherman, Chicago, we are having our Application Engineers and Plant Operation Engineers present at our exhibit booth to facilitate giving you information on war-time operation and maintenance problems and on present and post-war sewage projects.

We shall have for your review and study, data and illustrations on plant design and operation, based on our experience in actual operation of 160 Activated Sludge Plants. Information on cause and solution of specific problems affecting plant operation will be available to you.

Our background is based on furnishing equipment for over 1,000 municipal and war-time sewage plants.

There are 160 "Chicago"-equipped Activated Sludge Plants in Army Camps, Navy Bases, Municipalities, Housing Projects, Institutions and Industries.

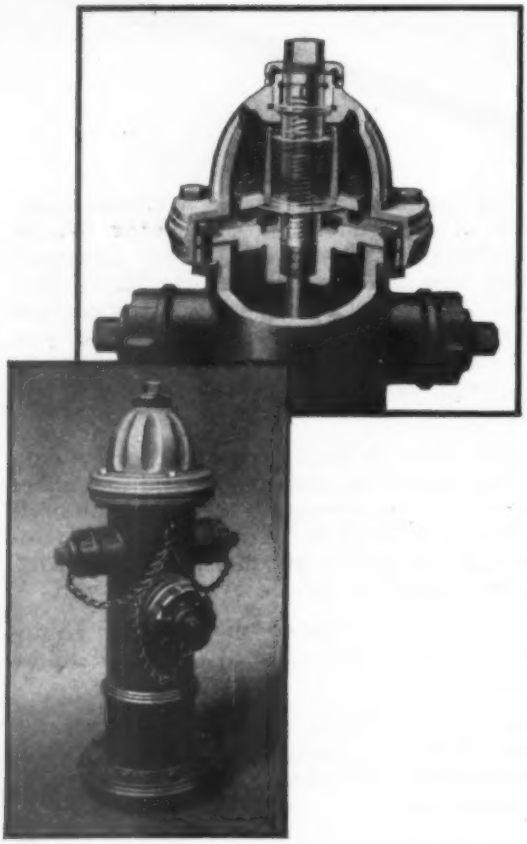
Process equipment has been furnished for 100 industrial and laundry waste treatment plants.

We shall be looking forward to seeing you at our exhibit.

S E W A G E E Q U I P M E N T D I V I S I O N

CHICAGO PUMP COMPANY

2336 WOLFRAM STREET . . . CHICAGO, ILL.



TOO LATE!

The time to replace balky, outmoded fire hydrants is before the fire—not after the damage is done. Rusty stem threads, dry packing, tangled nozzle cap chains, worn out main valves, and barrels broken suddenly in traffic smash-ups (and which have to be dug up) all contribute to the inefficiency of your fire department and help fire losses to mount . . . You can obliterate all these faults in one sweep by installing MUELLER-COLUMBIAN hydrants.

Consider just one outstanding feature—the self-oiling top. There is an oil reservoir in the bonnet section which keeps the stem threads and working parts constantly immersed in oil. In addition, each time the hydrant is used the oil is force-fed up to the operating nut. There can be no rusting or sticking. The packing is kept moist with oil and can never dry out. The unique ball joint construction above the packing positively prevents binding of the stem. No water ever enters the bonnet. Operates easily—readily serviced.

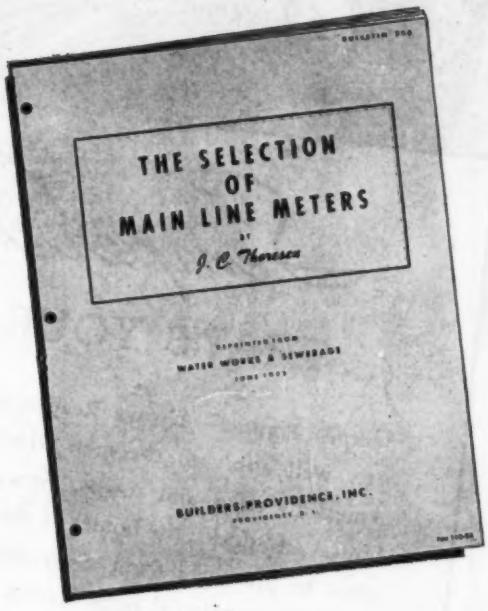
There are many other superior points in the MUELLER-COLUMBIAN. Ask about them. Give your fire department the best. Insist upon MUELLER-COLUMBIAN fire hydrants.

FOUNDED 1857

MUELLER CO.

CHATTANOOGA, TENN.

SEND FOR THIS PRACTICAL TREATISE



This highly informative and useful presentation, prepared by a competent engineer, J. C. Thoresen, simplifies the problem of selecting Main Line Meters. It describes forms of differential producers and quickly solves typical problems with the use of graphic charts. For your copy write Builders-Providence, Inc., 9 Codding St., Providence 1, R. I.

ARMY E NAVY
AWARDED
AUG. 3rd, 1942
STAR AWARD
MAY 8th, 1943

Sincerely Yours,

BUILDERS
RECORDING-INDICATING-CONTROLLING
Instruments

BUILDERS-PROVIDENCE

"Semper Paratus"

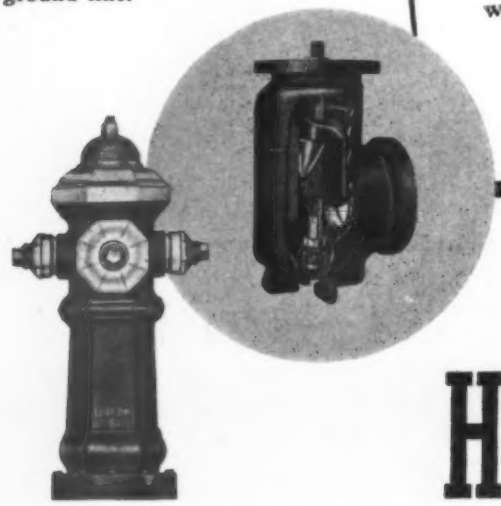
. . . THAT'S YOUR MOTTO, TOO!

Semper Paratus—Always Ready—the motto of the Coast Guard may well apply to the men who safeguard the water supply of America's cities and towns. Great war industries, the vast warehouses and docks, the homes of the worker and the man at the front must be protected from every danger—especially from destructive fires. The municipal organization that mans the water mains has a heavy responsibility these days—and is doing a grand job!

These dangerous days likewise prove the true worth of waterworks equipment. Ludlow Valves and Hydrants—because they were designed and manufactured to give rugged, persistent and efficient service —are serving faithfully today. Under priority permit, new Ludlow equipment and repair parts may be obtained and will be shipped with all possible promptness. Ludlow is always ready to serve.

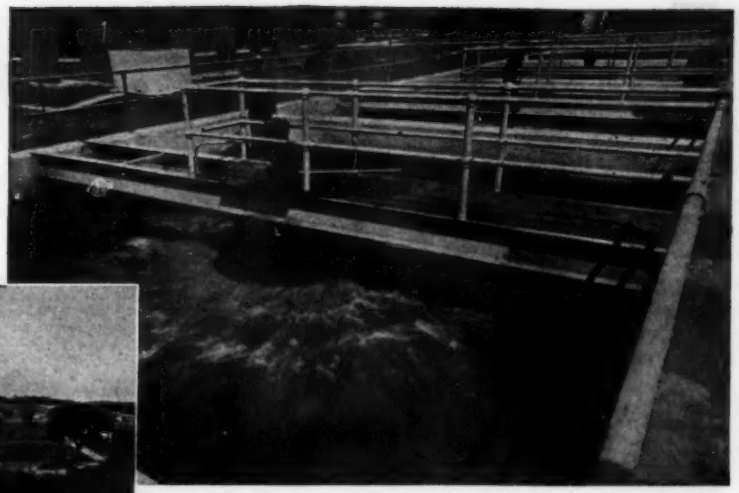
THE LUDLOW VALVE MFG. CO., INC.
TROY, NEW YORK

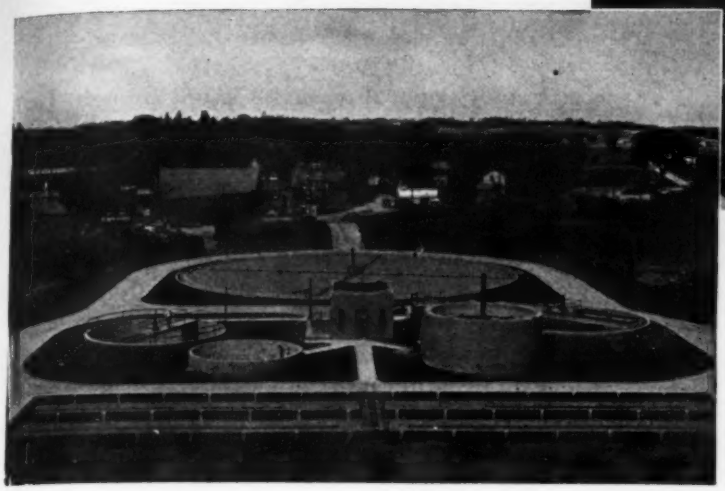
LUDLOW HYDRANT CONSTRUCTION: Self-releasing 30° angle wedges and free-floating gates, self-adjusting to seats, afford smooth, trouble-free performance, long service. Opening and closing of hydrant automatically opens and closes drain, located at lowest point. Clogging is prevented. Gate is wedge-locked when closed, to prevent flooding. All working parts may be lifted through top of hydrant for easy inspection. Top and bottom bodies bolted together at ground line.



LUDLOW
HYDRANTS AND VALVES
SINCE 1866

Remember—





IN YOUR POST WAR PLANNING

The INFILCO Equipped Sewage Treatment Plant Centralizes Equipment Responsibility and Assures Coordinated Results

You are invited to obtain recommendations and suggestions from INFILCO Sanitary Engineers with many years of experience in the design of equipment and its application to sewage treatment processes.

In furnishing every type of equipment required for a modern sewage treatment plant from Flow Meters to Final Clarifiers with Effluent Sand Filters, INFILCO offers the important advantage of undivided responsibility for successful equipment operation.

And—your plant will be in step with modern developments, because INFILCO has always been the first to introduce and adopt worthwhile improvements, as well as first to discard anything proving to be a hindrance to progress.

If a high B.O.D. reduction is indicated, investigate INFILCO Accelo-Biox Process (Accelerated Bio-oxidation), a *new high rate* activated sludge process.

INFILCO

SEWAGE TREATMENT EQUIPMENT

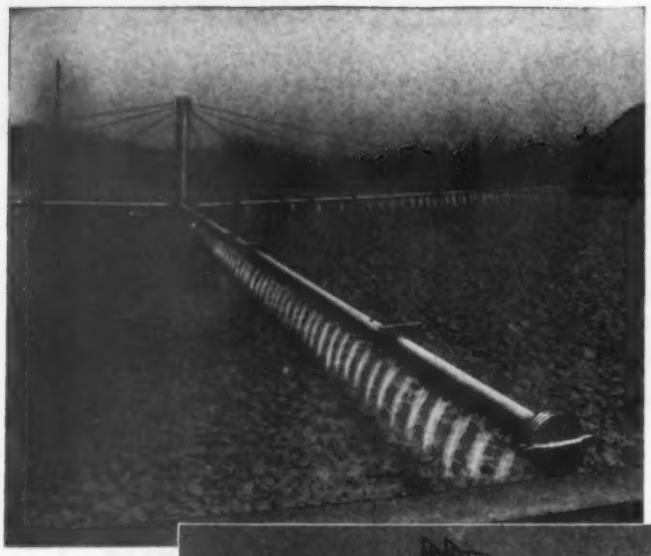
- Accelo-Filters
- Accelo Biox Process
- Aerators
- Automatic Controls
- Chemical Feeders
- Clarifiers
- Coagulators
- Digesters
- Dosing Siphons
- Effluent Filters
- Filter Equipment
- Flow Controllers
- Flow Gauges
- Gravity Filters
- Lime Slakers
- Mixing Equipment
- Proportioners
- Rotary Distributors
- Sewage Samplers
- Sewage Activators
- Sewage Griductors
- Venturi Tubes

ARMY E NAVY

INFILCO
INCORPORATED

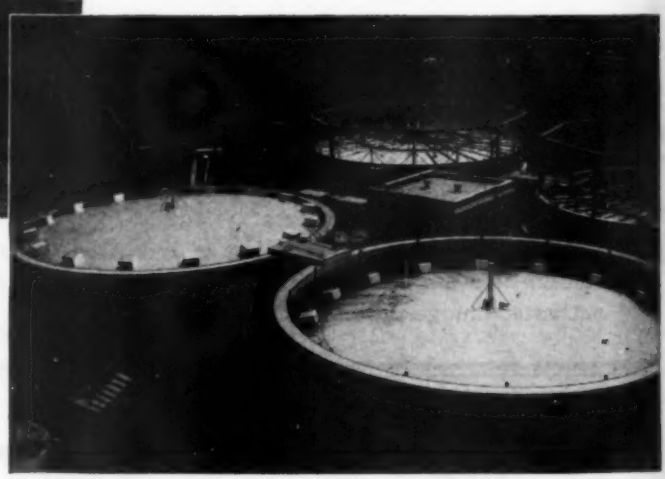
325 W. 25TH PLACE, CHICAGO, ILL.

For today and tomorrow... and *years to come!*



135ft.diameter,three-arm Graver Rotary Distributor installed at a Midwestern internment camp.

A typical Graver Pressure Sphere designed for 20 lbs. per square inch working pressure.



Two 75 ft. diameter Graver Digester Floating Covers installed at a Midwestern municipality.

Satisfactory operation alone is not enough. To meet our standards, every piece of Graver Sewage Treatment Equipment must deliver complete satisfaction for years to come. And because the entire job is engineered and built in Graver plants and installed under the supervision of Graver engineers, there can be no deviation from this high standard of quality and service.

Graver builds Sewage Treatment Equipment to meet every requirement. Included in the line are:

- Aerators
- Agitators
- Automatic Dosing Siphons
- Chemical Feeders
- Chemical Proportioners
- Chemical Treatment Plants
- Coagulators
- Clarifiers, Primary and Secondary
- Digesters
- Gas Holders
- Grease Removal Equipment
- Imhoff Combination Clarifiers
- Reactivator Clarifiers
- Rotary Distributors
- Skimmers
- Sludge Conditioners
- Sludge Dryers
- Sludge Filters

In planning for your present or post-war requirements, consult Graver. Our engineers will gladly work with you or your consulting engineers in the development of the proper equipment to meet your needs. A consultation incurs no obligation.

GRAVER

SEWAGE TREATMENT EQUIPMENT

GRAVER TANK & MFG. CO., INC.

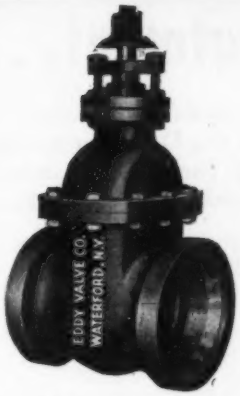
4809-43 Tod Ave., East Chicago, Ind.

NEW YORK CATASAUQUA, PA. CHICAGO TULSA

43-43W

EDDY

FIRE HYDRANTS
AND VALVES—
WATER WORKS EQUIPMENT



EDDY VALVES
For
Water Works
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EDDY VALVE CO.
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EDDY FIRE
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For Fire
Protection
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Write for Complete Catalog

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VALVE COMPANY
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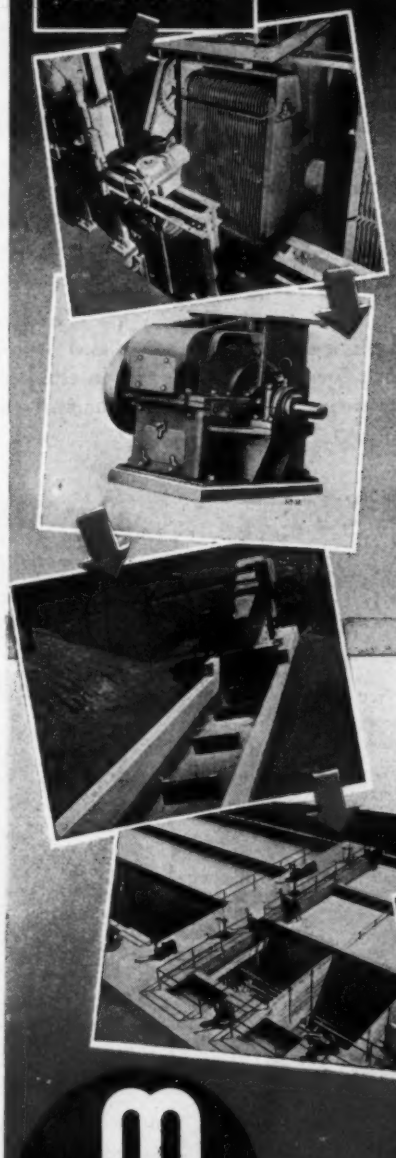
Rx for Sewage, Water and Industrial Waste

PURIFICATION

RAW SEWAGE



What is more important than the purification plants which treat millions of gallons of water, sewage and industrial wastes daily?

The photos (left) show the latest in mechanization for a modern sewage treatment plant producing a clear, purified effluent. Similar treatment processes for water and industrial waste.

By continuing development, Jeffrey equipment is built to meet each new rise in standards demanded by progress. It has proved its worth in both small and large plants.

Our sanitary engineers are intimately familiar with all phases of purification . . can help you build to higher civic and health standards.

Our NEW Catalog No. 775 goes into detail . . send for it.

CLEAR EFFLUENT

JEFFREY .... ESTABLISHED 1877

THE JEFFREY MANUFACTURING COMPANY
969-99 North Fourth St., Columbus 16, Ohio

SALES OFFICES:
Baltimore, Birmingham, Boston, Buffalo, Chicago, Cleveland, Cincinnati, Detroit, Denver, Huron, Houston, Huntington, Milwaukee, New York, Philadelphia, Pittsburgh, Scranton, St. Louis, Salt Lake City

HOW TO RECONDITION YOUR VALVES TO GIVE YEARS OF *rust-free* SERVICE

before treatment...

Note the heavy rust deposits on valve parts such as seats, stems, bonnets, and discs.

As rust accumulates, orifices are gradually closed, reducing the volume of water passing through, impairing the efficiency of your service.

Corrosion interferes seriously with the efficient opening and closing of the valve. It will not form in valves treated with NO-OX-ID Rust Preventive.

after treatment...

Note what has taken place when a corroded valve goes through the Dearborn system of valve reconditioning. All parts are protected against corrosion, thus restoring new valve efficiency.

The time to recondition your valves in service and storage is *NOW*. We will instruct your men in the proper method of application. Just write to us and one of our engineers will call.

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NEW YORK • LOS ANGELES • TORONTO

•[For Victory, Buy United States War Bonds and Stamps]•

QUICK FACTS ON TRANSITE SEWER PIPE

FAST INSTALLATION . . . Transite's long lengths reduce the number of joints needed in the line . . . its light weight permits easier, faster, more economical handling.

LESS INFILTRATION . . . Fewer, tighter joints minimize leakage, cutting down on the load at the disposal plant.

HIGH DELIVERY CAPACITY . . . This advantage of Transite Pipe frequently permits smaller pipe or flatter grades, resulting in shallower trenches.

AVAILABLE BOTH FOR FORCE MAINS AND GRAVITY LINES . . . Complete information is given in brochure TR 21A. And for details on lower-cost water transportation, send for Transite Water Pipe Brochure TR 11A. Johns-Manville, 22 East 40th Street, New York, N. Y.

ENGINEERING DATA

GRAVITY TYPE

Sizes: Class 1— 4" to 36" Class 3—10" to 36"
Class 2—10" to 36" Class 4—18" to 36"

Crushing Strengths:
A.S.T.M. 3-edge bearing test method

Pipe size inches	Lb. per linear ft. Class 1	Class 2	Class 3	Class 4
4	4125	....	....	....
5	3350	....	....	....
6	2880	....	....	....
8	3100	....	....	....
10	2580	....	....	....
12	2370	3690	4920	....
14	2200	3850	5100	....
16	2120	3920	5150	....
18	2030	4050	5280	....
20	2290	4140	5360	....
24	2340	4280	5850	6340
30	2980	4550	7050	7100
36	3500	5000	8180	8600
		5400	9700	10450
				12300

Friction Coefficient (Kutter's); n=.010

PRESSURE TYPE

Sizes: 3" to 36"

Pressure classes: Class 50— 50 lbs. per sq. in.
Class 100—100 lbs. per sq. in.
Class 150—150 lbs. per sq. in.
Class 200—200 lbs. per sq. in.

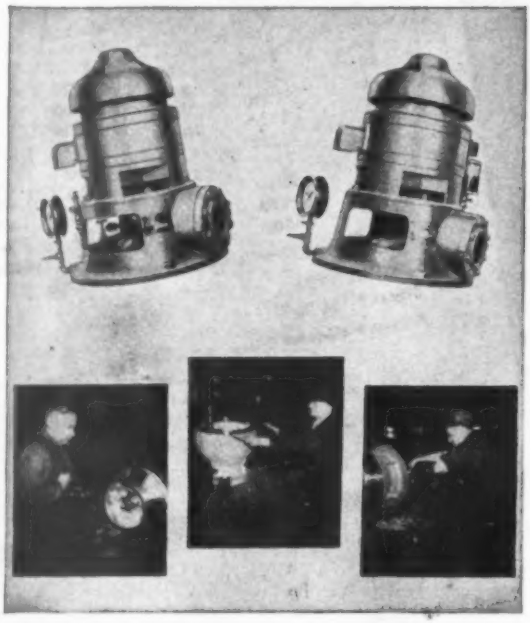
Friction Coefficient (Williams & Hazen): C=140

JM Johns-Manville

TRANSITE SEWER PIPE

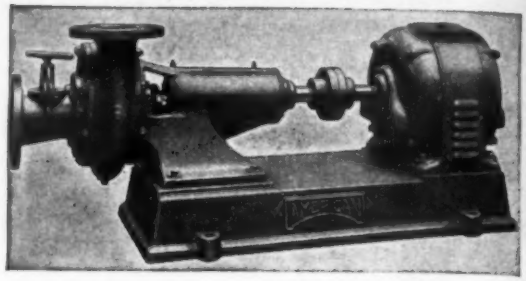
An Asbestos Product

American Pumps



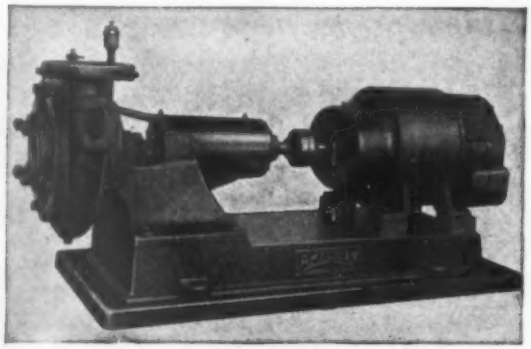
Deep Well Turbine Pumps

Send for Bulletins
No. 245—Water Lubrication
No. 247—Oil Lubrication



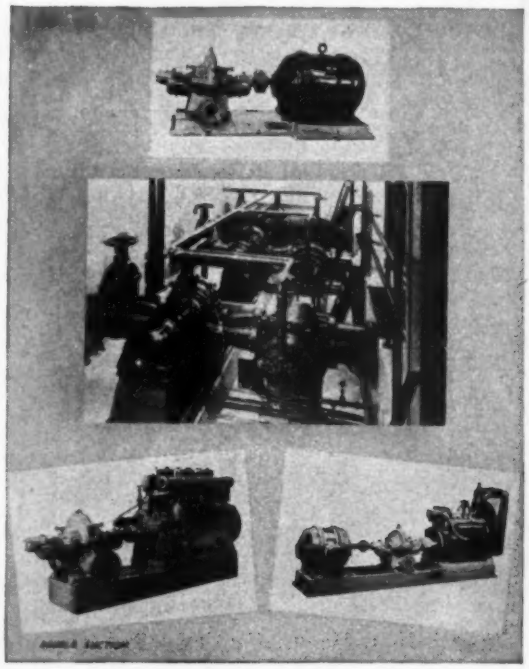
Primary Sludge Pump

Send for Bulletin No. 261



Sewage Pump

Send for Bulletin No. 250



Double Suction Pumps

Send for Bulletin No. 248

Not "When the Shooting Stops" but NOW!

In CHEMICAL PROPORTIONING PUMPS ...Wilson Pulsafeeders are prepared to serve now, if you are in the war effort.

Based on the sound mechanical principle of positive displacement, Wilson Pulsafeeders perform beyond expectation. In addition there is no contact between chemical handled and operating parts of the Pulsafeeder. No packing glands to cause interruptions. No diaphragm breakage.

★

Whether your need is for accurate control at one cubic centimeter of liquid (chemical) per hour... or 400 gallons of liquid (chemical) per hour... there is a size Wilson Pulsafeeder that will serve your needs exceedingly well.

★

ACCURACY
is guaranteed at better than 1/8 of 1%

★

Because RESULTS speak most eloquently, Government agencies and unbiased leading authorities are enthused with the HIGH MERIT of Wilson Pulsafeeders.

★

We suggest you WRITE FOR LITERATURE, AND if possible, tell us briefly about your immediate or future needs.

HIGH MERIT
WILL SERVE YOU BEST
WILSON
PULSAFEEDER
Chemical Feeders

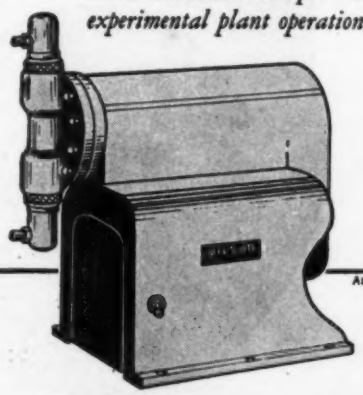
Feeds chemical solutions (single or multifeeders) against high or low pressures at constant predetermined rate of feed, manually adjustable.

For WATER and Sewage sterilization and treatment, feeds hypochlorite, alum, soda ash, calgon, lime, iron salts and other treatment chemicals.

For PROCESSING industries including Foods; research laboratories for experimental processes, accurate liquid measurement, filling ampoules and other uses requiring positive results.

●

For DIFFICULT PROBLEMS such as handling concentrated and dilute acids, volatile chemicals, slurries and high and low viscosity liquids. Hundreds of problems in chemical and food processing have been solved by Wilson Pulsafeeders, including time controlled dosing, automatic pH control, adding re-agents, alkylation acid feed, automatic titration and pilot or experimental plant operation.



AD K-2

WILSON CHEMICAL FEEDERS, INC.

Est. 1931 ... with experience in allied lines since 1914

Two complete plants—MANUFACTURING *Chemical Feeders for Water Conditioning and Processing Industries... and, by merger with Clevon Products Co. (Est. 1903), Automatic* LIQUID FILLING MACHINES *for the same industries.*

203-9 CLINTON STREET (P. O. Box 998) BUFFALO 4, N. Y.

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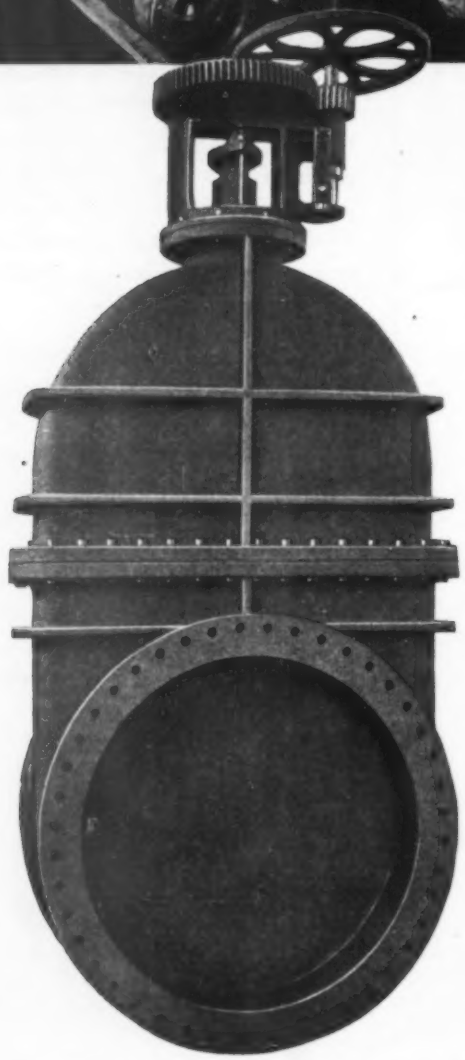

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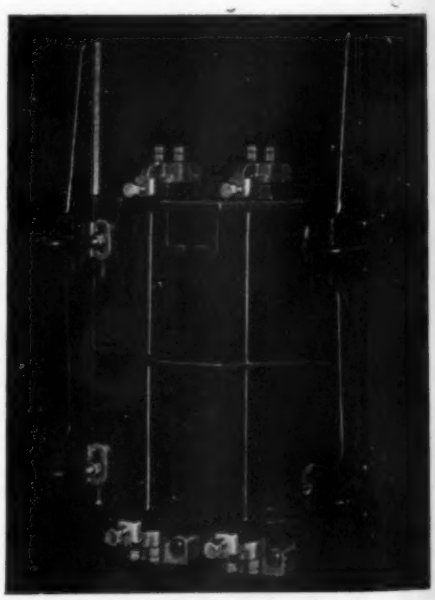

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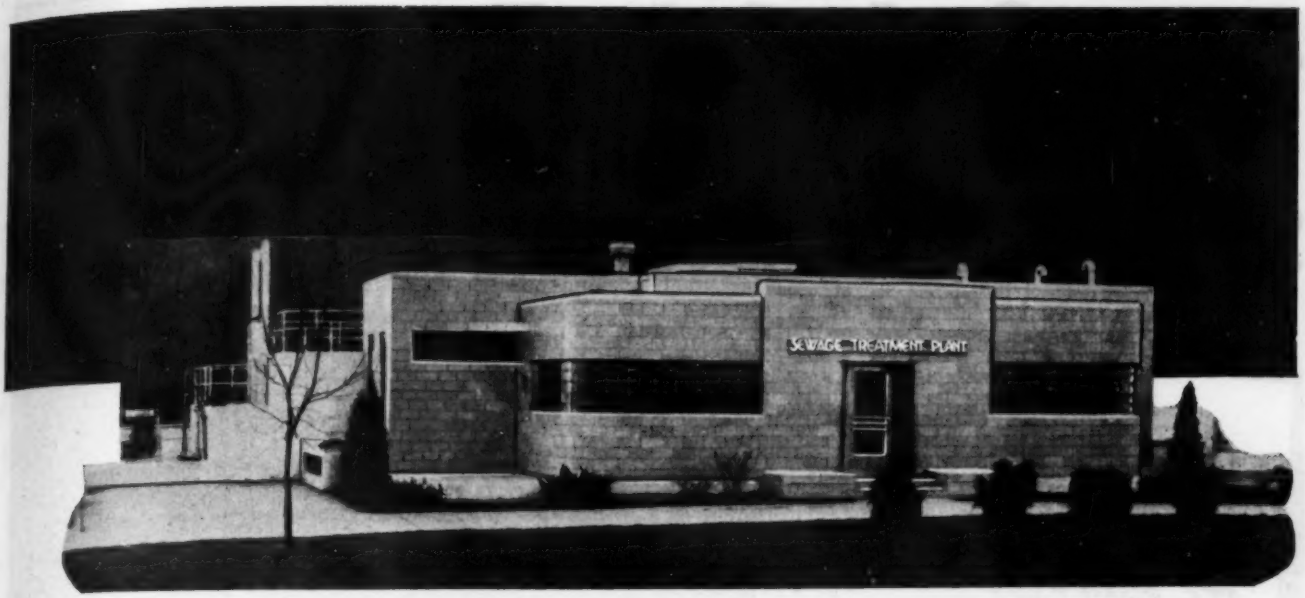

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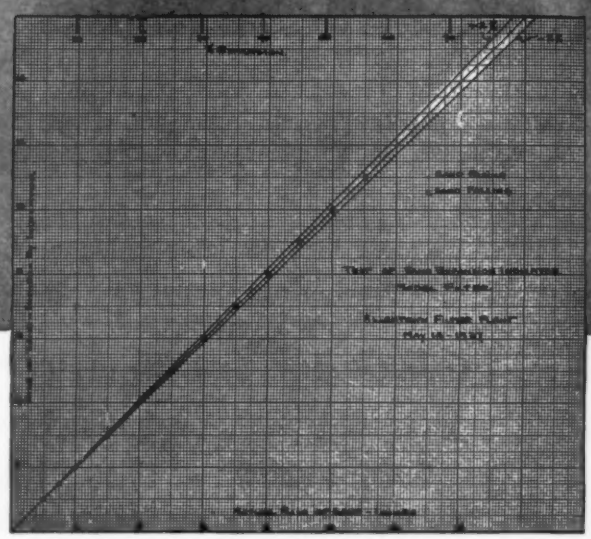

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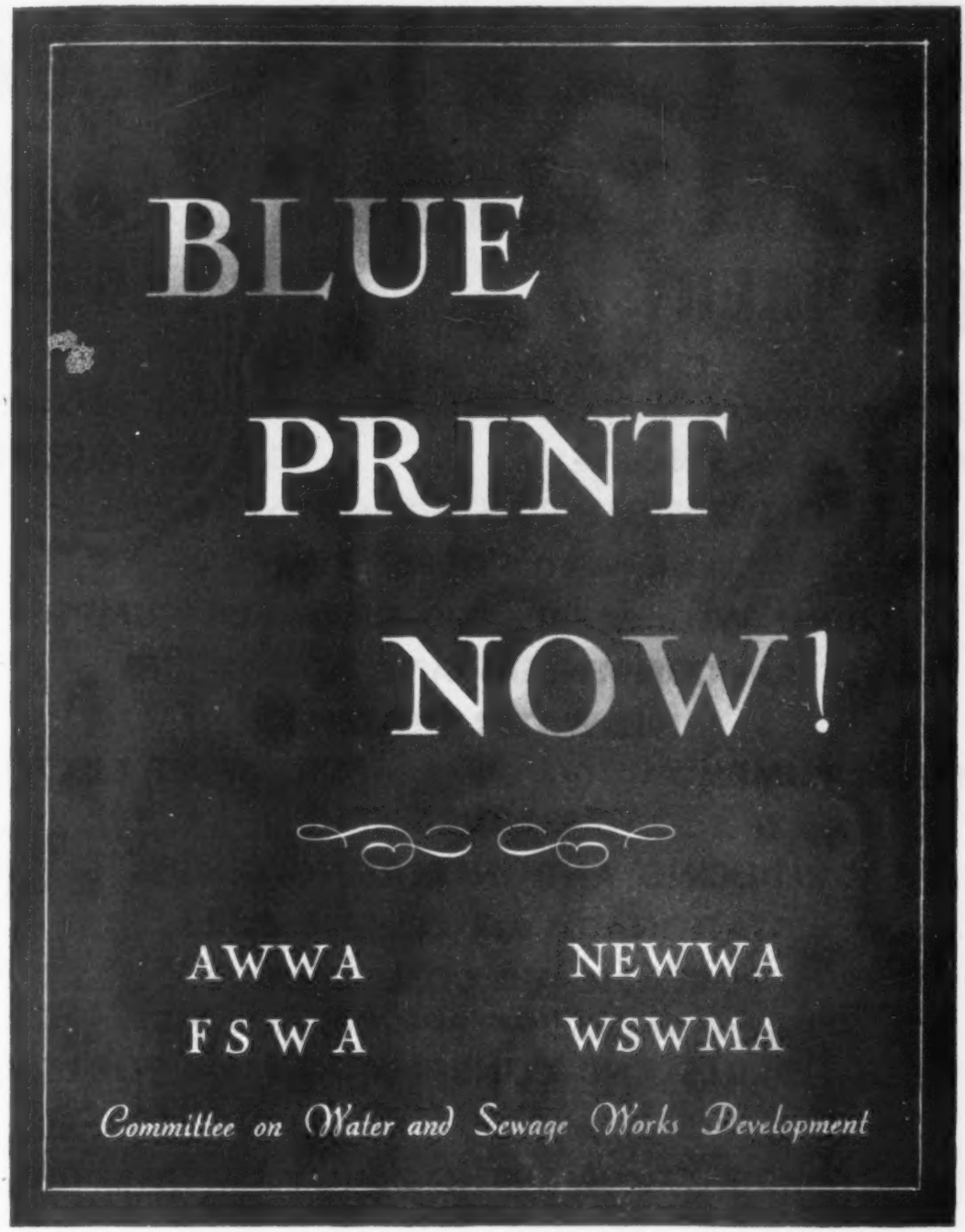

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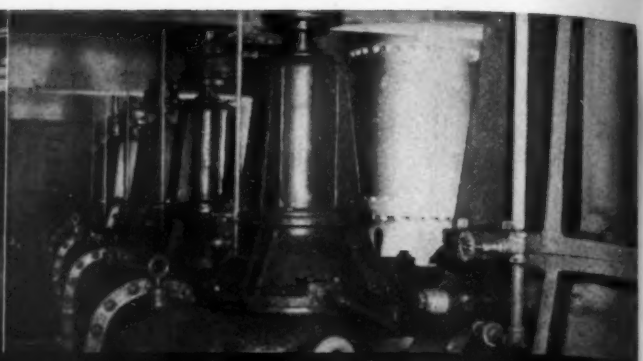
Sewage sludge gas engines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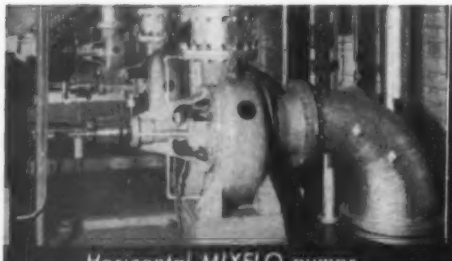
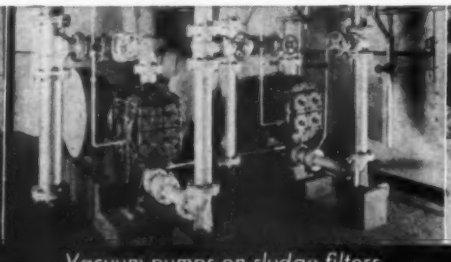
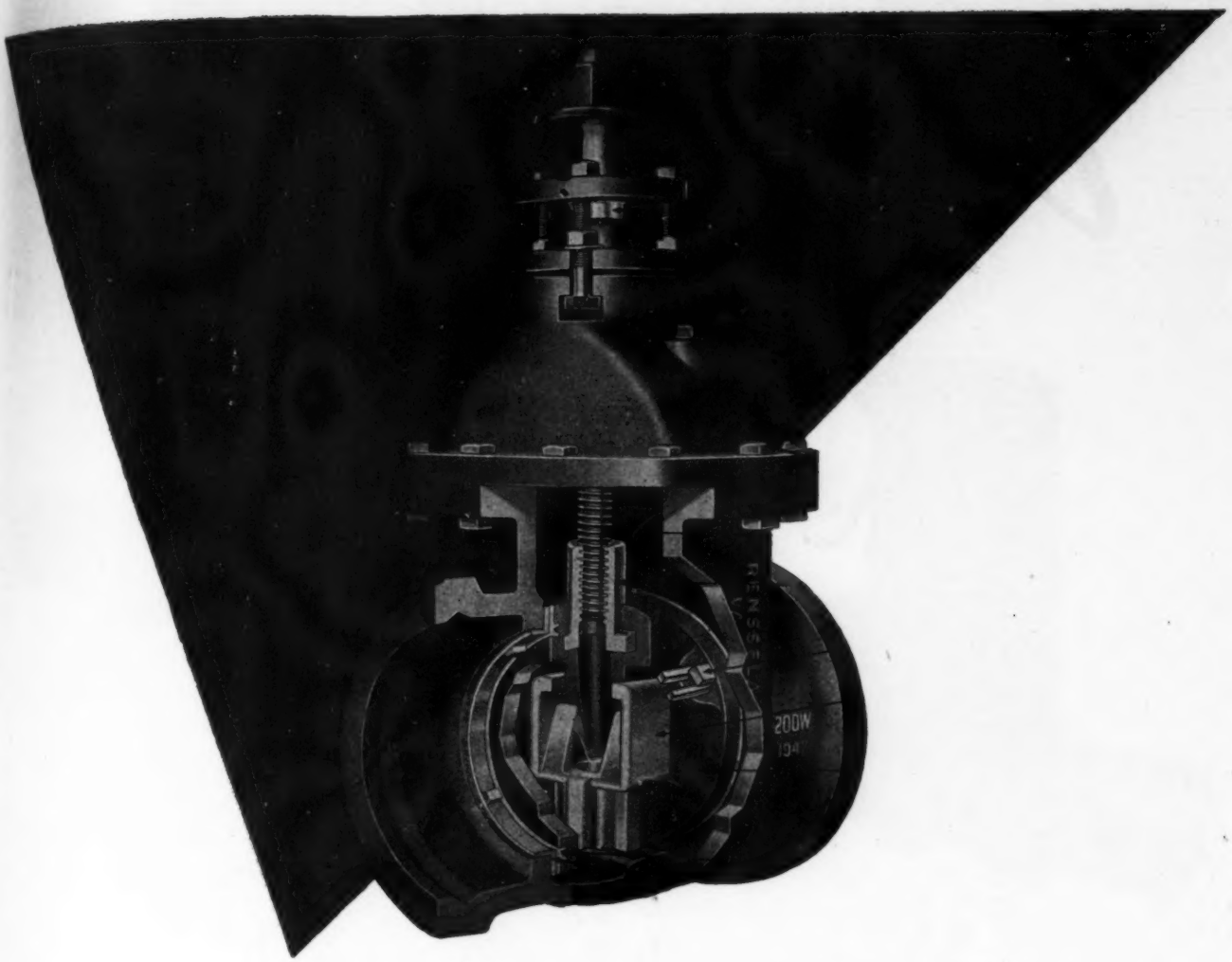

Horizontal MIXFLO pumps


Vacuum pumps on sludge filters

Portable compressors



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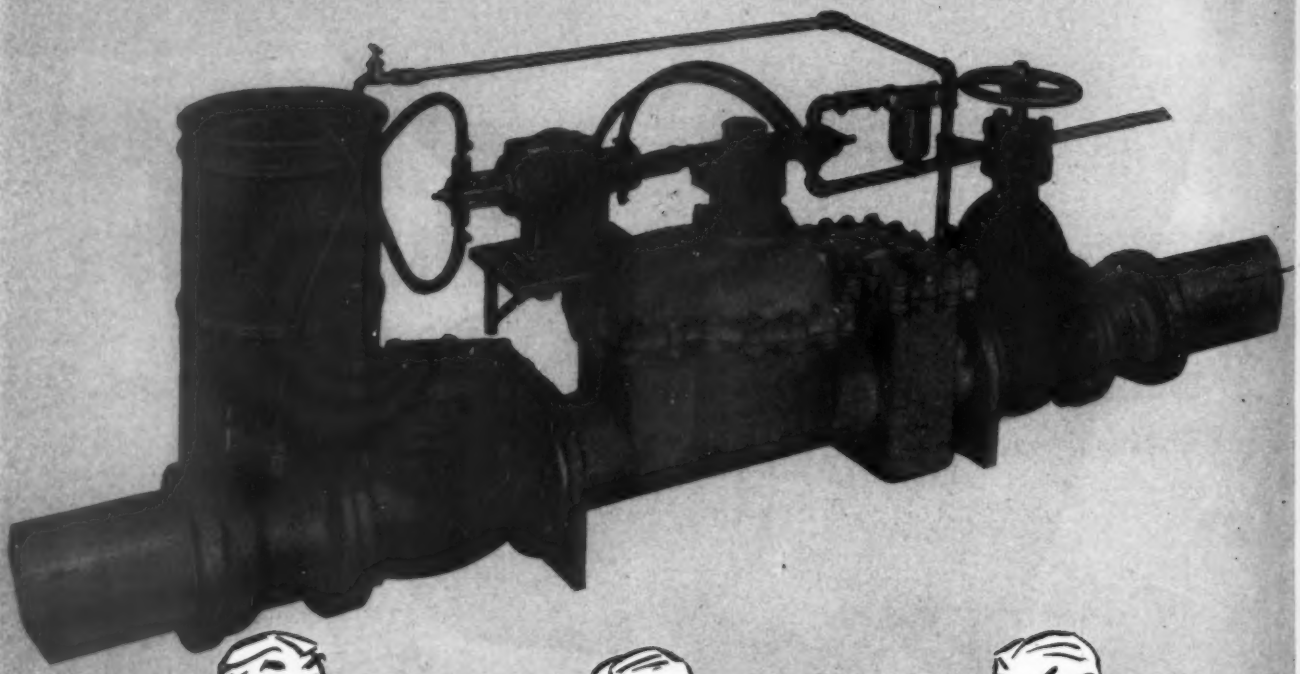

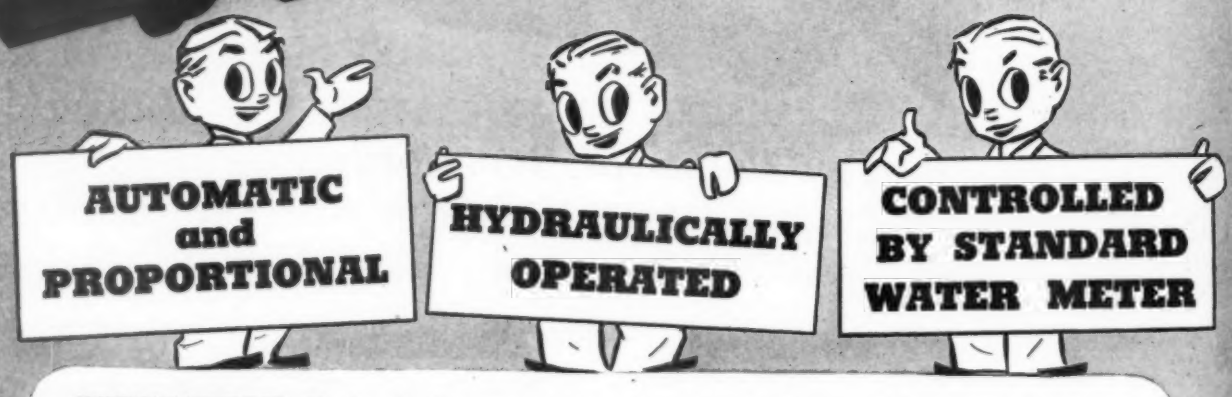

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330 South Wells Street, Chicago, Ill.
E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

Readers will observe that this issue is, as was planned in September, preponderantly a Sewerage issue and is being dedicated to the Sewage Works Federation Conference—as the preponderantly Water Works Issue of September was dedicated to the New England Water Works Association Convention.

With Regrets!

We find it necessary to postpone the publication of two meetings reports scheduled for this issue—reports covering the joint meeting in Pittsburgh of the Pennsylvania Section of A.W.W.A. and the Penna Water Operators Association; and, also, the meeting of the N. Y. Section of A.W.W.A. Both of these reports will appear in our November issue.

"Standards for Water Service"

Is the story of methods, developed in Richmond, Va., and the establishment of certain "standards" for water service which has involved careful forethought, study and trial prior to adoption as "official standards" by the Common Council. Involved are "Pressure Standards"; "Permissible Sizes of Service Lines and Meters"; "Basis for Installation Charges for Service Lines and Meters." These last two "standards" will be of especial interest to every water utility manager. This meaty contribution comes from a name already well known for innovations and economy measures—

MARSDEN SMITH, Chief Engineer,
Dep't of Public Utilities, Richmond, Va.

"Paint Requirements for Elevated Tanks"

Is an item of interest to anyone contemplating the repainting of elevated tanks and standpipes. Amongst other things this article will enable waterworks managers to closely estimate the quantity of paint required for repainting tanks of the various popular sizes, and reveals what the approximate cost will be for various types and grades of satisfactory paints. Where the repainting job is let to contract the estimated paint requirements and costs will serve as a useful indicator as to what the charges by a qualified contractor should be. The author is—

JOHN M. PERRYMAN, Contract Engineer,
R. D. Cole Mfg. Co., Newnan, Ga.

"Treating Slaughter House Wastes With Recirculating Filter"

Is a discussion of the installation and operation of a recirculating trickling filter on the slaughter house wastes of a plant in Michigan. Data on operation of the filter as well as the design are presented by—

E. F. ELDRIDGE, Prof. San. Engineering,
Michigan State College.

Depreciation

Is a never ceasing topic of interest in utility accounting, and this is the subject of a thorough discussion in respect to depreciation accounting in water works practice. Involved in the study to be reported is a nation-wide survey of methods and practices as now applied by representative water utilities, with a discussion of the good and the bad—as it exists in present day practice—and suggested remedies looking toward uniformity in depreciation accounting in the water supply field. The author is—

N. T. VEATCH, Jr., Consulting Engineer,
Black & Veatch, Engrs., Kansas City, Mo.

"Laundry Waste Treatment by Floatation"

Is an article which advocates removal of flocculated laundry waste solids by floatation and skimming rather than precipitation. Comparative results and costs are revealed from studies made on fractious laundry wastes from U. S. Army Camps and reported by—

MAJOR ROLF ELIASSEN,
U. S. Engineers, New York, N. Y.

"Pneumatic Caulking of Pipe Joints"

Is a description of the time and labor saving use of the compressed-air hammer for caulking pipe joints. Results from its use for several years and costs are revealed in an interestingly told story from—

H. W. HORN, Construction Engineer,
Bureau of Water, Allentown, Pa.

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WATER WORKS & SEWERAGE

VOL. 90, No. 10 *A Gillette Publication* OCTOBER, 1943

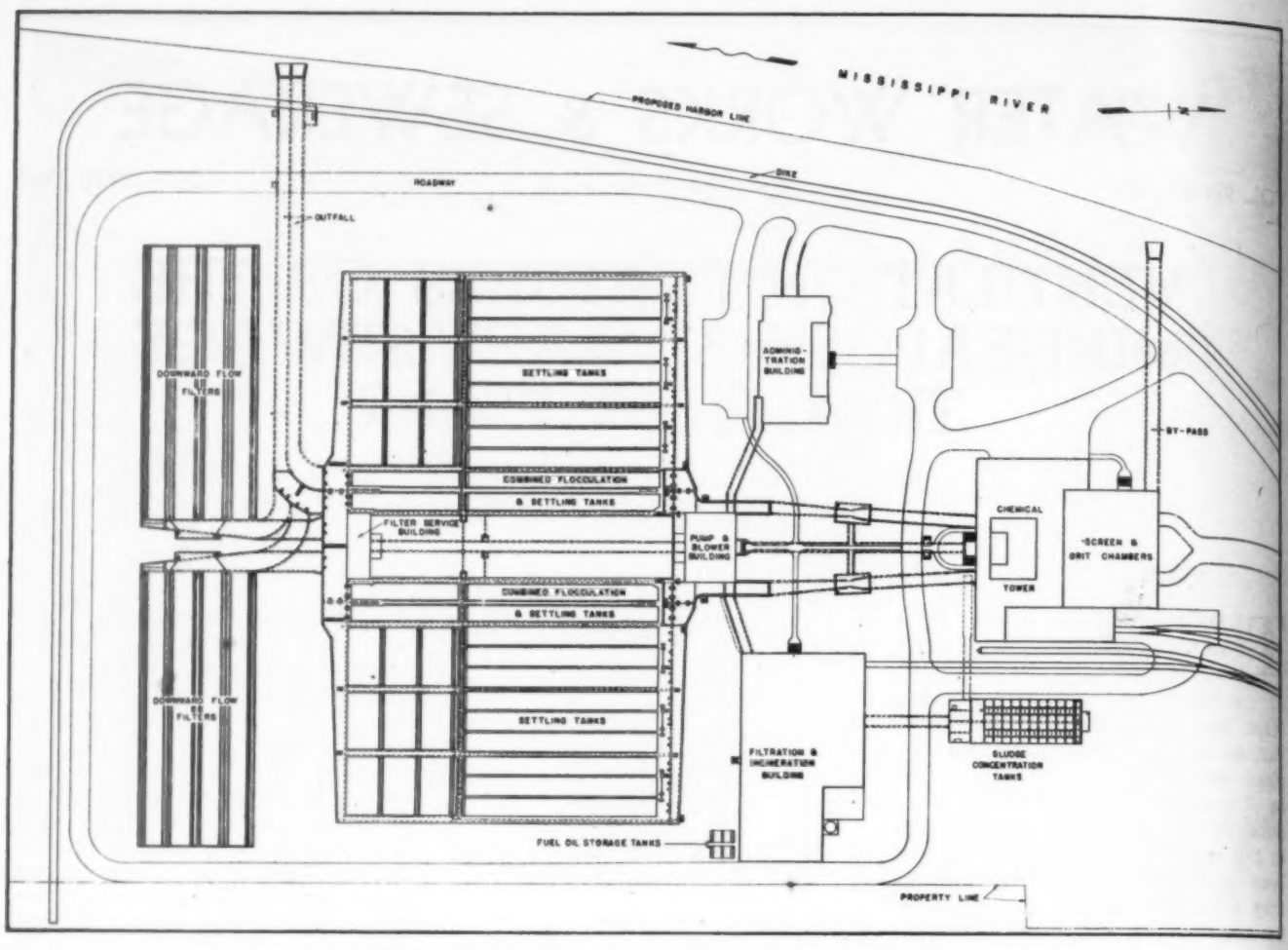
VENTILATION FEATURES OF THE MINNEAPOLIS-ST. PAUL SEWAGE TREATMENT PLANT

By GEORGE J. SCHROEPFER
Chief Engineer and Superintendent
MINNEAPOLIS-SAINT PAUL
SEWAGE TREATMENT PLANT

THE Minneapolis - Saint Paul Sanitary District Plant has been in operation for a period of five years. This period of operation has permitted certain observations of the performance of the plant ventilation system which may be of interest to others in this field. Some of the provisions incorporated in the design for odor control have been so simple and satisfactory that they have been "taken for granted" by members of the operating staff, many of whom were also responsible for the design and construction of the system. As in all sewage treatment plant projects, the problems of operation and maintenance have been many and varied, some easy and some difficult of solution. Fortunately, the odor problem has not been included among the difficult ones. It is possible that the reason in part for this good fortune is the character of the sewage entering the plant, but credit must also be given to the design features incorporated for odor control. As in all such matters, some of the provisions included are peculiar to this project, and may not be of general interest, but the description of certain features may be of value to others, and that is one of the reasons for this exposition. The other reason is the persistent urging of the editor of WATER WORKS AND SEWERAGE, who, since his visit to the plant in June of 1942, has apparently been in-

The Author
(President of the Sewage Works Federation)

General View of the Main Buildings of the Sewage Treatment Plant of the "Twin-Cities"
(Screenings, Grit and Chemical Bldg. on left; Sludge Filtration and Incinerator Bldg. in center; Administration Bldg. and Laboratories on right)



Key Layout Sketch of the Minneapolis-Saint Paul Plant
(See picture opposite)

clined to feel that something worthy of comment has been attained through the design and operation of this system from the odor control standpoint. Perhaps, therefore, there is a third reason for this article, viz., the desire to show the simplicity and reasonableness of the ventilating provisions for removal of humid sweat and corrosion producing vapors and dangerous or odoriferous gases.

The Treatment Plant

To aid in the consideration of what follows, it is desirable that the plant type and size be borne in mind by the reader. The plant, designed for a flow of 134 mgd., is of the chemical-mechanical type, and consists of screen and grit removal and a two-hour sedimentation. This treatment can be augmented under unfavorable stream dilution conditions by effluent filtration, flocculation without chemicals, and chemical treatment to various degrees, or any combination thereof. Provision for disinfection (pre- and post-chlorination) during the summer season is also included. The sludge disposal system consists of concentration, vacuum filtration and incineration in multiple hearth furnaces. The plant receives the sewage from the metropolitan area of Minneapolis and St. Paul, in which there are located a number of different types of industries. The total present sewage flow averages approximately 130 million gallons per day.

The importance of the plant will be realized when it is considered that in the course of a year approximately 40 billion gallons of sewage is treated, from which approximately 75 million pounds of sewage solids, formerly discharged into the river, are removed and rendered inert by the treatment and sludge disposal processes. In the first two years of operation of the plant, the amount of solid material removed would fill 7,000 railroads cars of 30 tons capacity each.

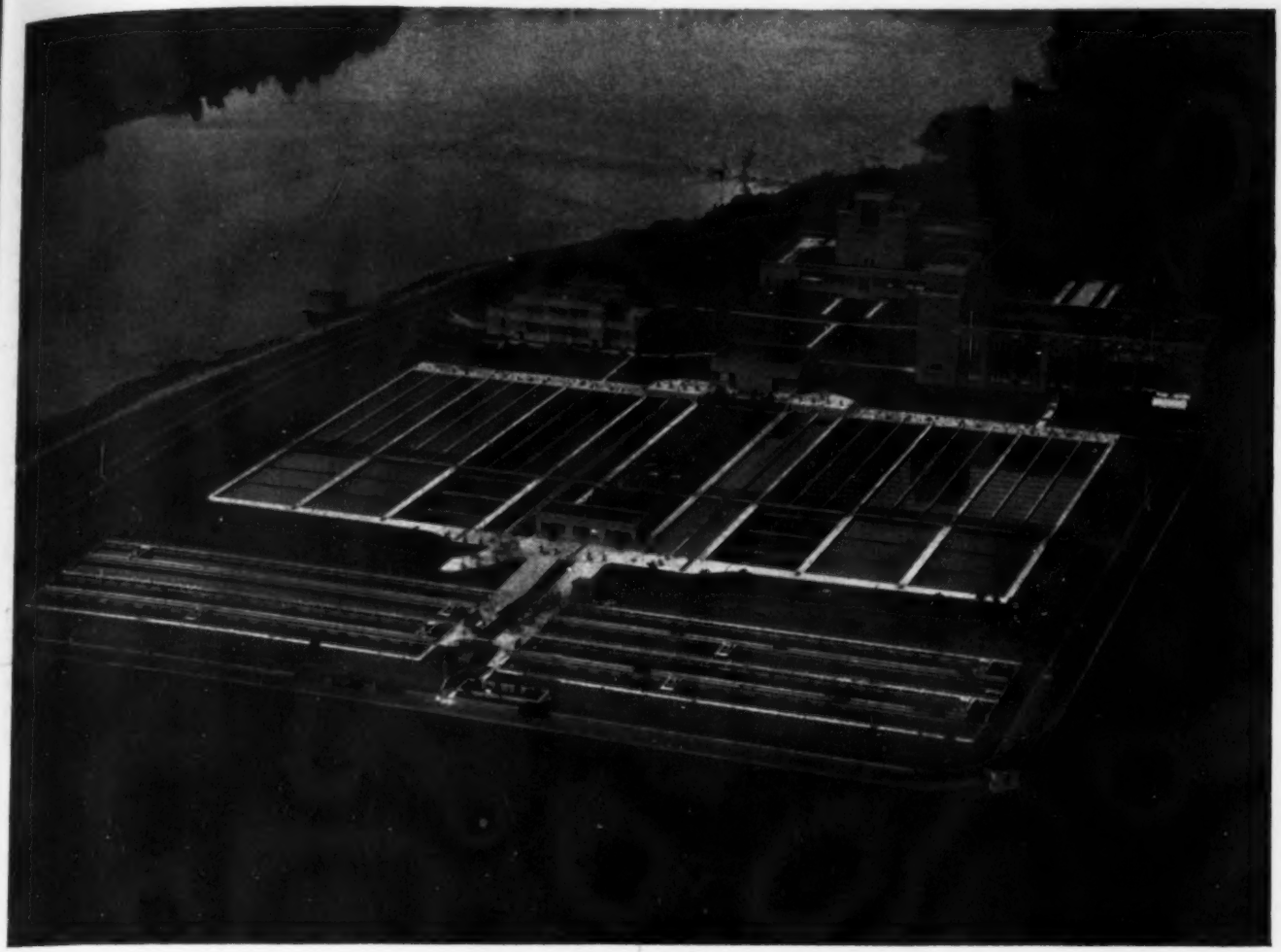
In the operation of the treatment plant, a total of 65 pumps are involved, and the total number of motors in the plant is approximately 350 varying in size up to 75 horsepower.

The total annual charges of the treatment plant, including operation and maintenance costs, interest and retirement of bonds, will cost about 70 cents per person yearly. This compares with $1.30 as the average for 75 cities throughout the United States on which cost data is available.

It is gratifying to point out that the plant has operated more efficiently from the standpoint of accomplishment than was anticipated when designed. In addition, the operating expenses have been even less than the expected costs.

Need for Odor Control Features

In addition to the usual reasons for thorough investigation of the odor control and ventilation problem, such as reduction of explosion hazards, improvement in general conditions about the plant as affecting public reaction to the efficiency of operation, elimination of odor complaints and possible damage suits, reduction in concrete disintegration, etc., the fact that the average flow time of the sewage in the system is approximately 10



General View of the "Twin-Cities" Treatment Plant Looking North or Up River
(For various units pictured refer to layout sketch on opposite page)

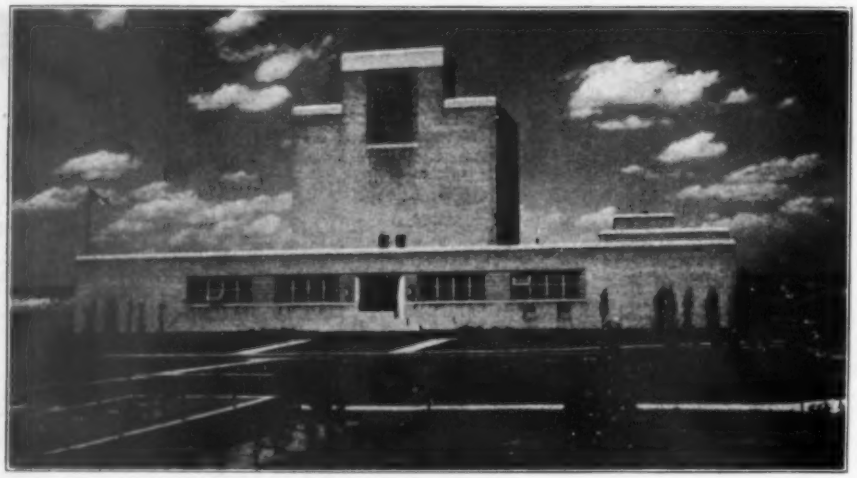
hours and that some of the sewage travels as far as 18 miles, played no small part in the carefulness of the consideration of the odor hazard in this project. Another factor, which was impressed on the author in the early stages of the project was the force of public, legal and legislative opinion as they can affect an entire project of this type because of the popular erroneous conception of what a modern sewage disposal plant is like. Threatening legislative enactments which sought to locate the plant at prohibitive distances from the cities had to be defeated. Residents (two miles and more from the plant) had to be persuaded that their health would not be jeopardized, and that their homes would still be habitable if the plant were located as proposed. Legal injunctions had to be encompassed. All these practical problems, while not new or peculiar to this project, were forcefully impressed upon the author and were ever carried in his mind as design of the project progressed.

Sewer Scavenging and Ventilation of Screen and Grit Chambers

As an odor control measure, the screen and grit chambers in this project are completely covered by a concrete slab. All access openings are completely covered. Openings in the slab through which screenings and grit removal equipment operate and the equipment itself are covered by steel housings. Materials removed are not handled in the screen and grit building, but instead are deposited on conveyor belts running in a depressed trough, completely covered with steel floor plates, which conduct the grit and screenings to a separate service room. The entire screen and grit chamber substructure is covered by an attractive brick and stone superstructure pictured herewith. The superstructure, in addition to providing a means of odor control, provides suitable working conditions in this cold climate, and also permits appurtenant uses such as chemical and chlorine feed rooms, storage space, etc., which would otherwise require buildings with separate foundations.

As has been indicated, the complete covering of the screen and grit chambers by a concrete slab and the housing of the whole with a superstructure provides methods of ventilation and odor control not otherwise available. By a system of ducts, ventilation of the following essential points could be provided: (1) the incoming sewer; (2) the screen chambers; (3) the grit chambers, and (4) the superstructure housing the screen and grit chambers. By the inclusion of a proper system of dampers all or various portions of the capacity of a 20,000 cubic feet per minute fan can be directed to the exhaustion of gases from these different points.

As a means of odor and explosion hazard control, the exhaustion of gases from the incoming sewers deserves some discussion. By means of a hinged baffle wall to which are attached aluminum floats of sufficient buoyancy to cause the baffle to "ride" on the surface of the sew-

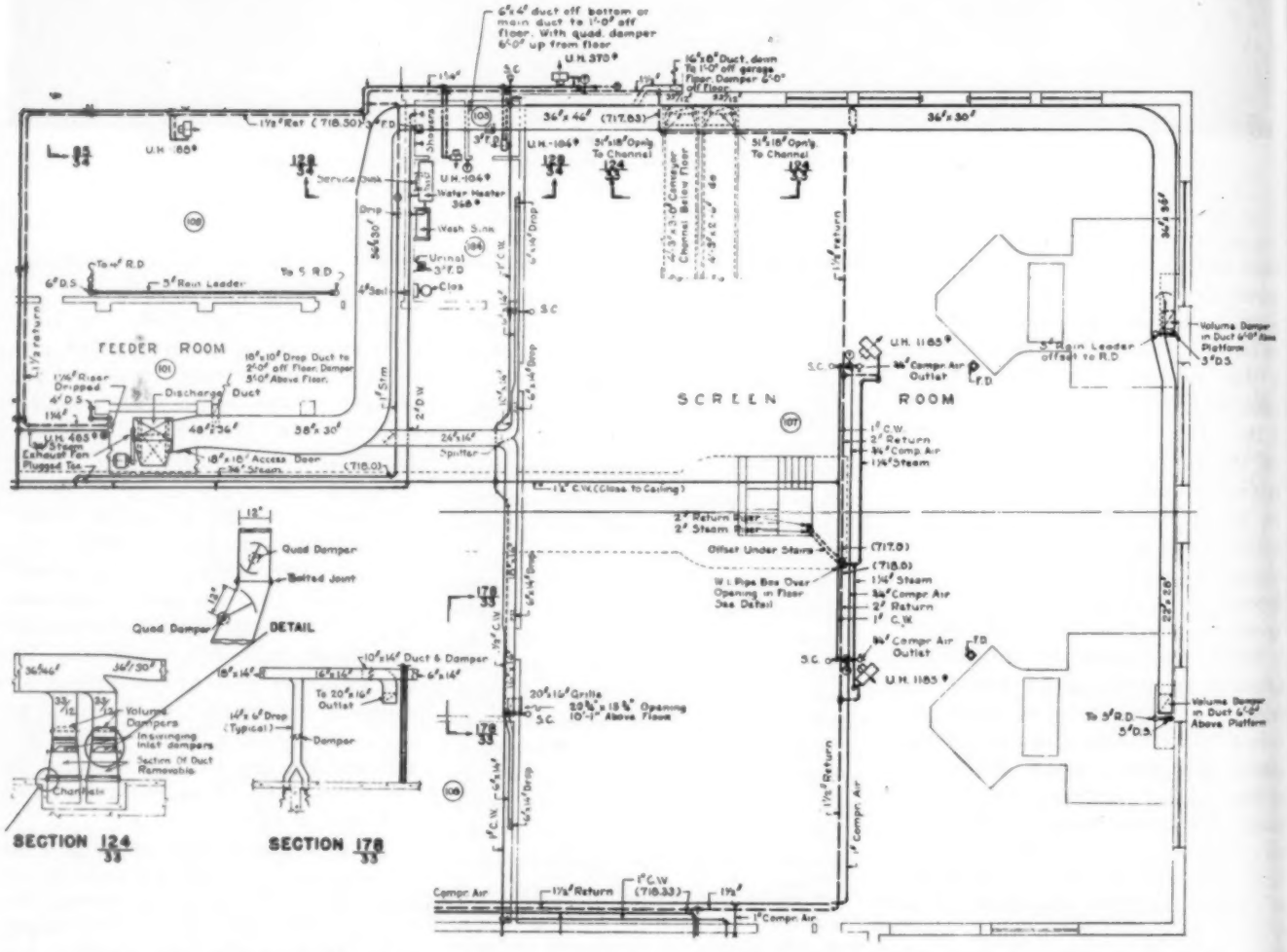


The Grit, Screenings and Chemical Building

age, it is possible to effectively seal and segregate the incoming sewer from the screen and grit chambers. With the inclusion of this floating gate it is possible to separately ventilate the incoming sewer as distinguished from the balance of the system. During the winter months, for example, it is possible to exhaust a major portion of the fan capacity from this point, without the need for heating an enormous quantity of air which would be necessary if the entire fan capacity was used to draw from the building, rather than doing most of the job of scavenging by operating the sewer take off and not permitting the gases and vapor to enter the building.

In its course from the incoming sewer to the fan the ventilating duct system passes overhead through the superstructure, with connections to each of the four screen chambers and to each of the eight grit chambers. At various points along the system adjustable openings are provided to permit the exhaustion of air from the superstructure. By closing off all other inlets, the entire fan capacity can be directed to exhaust from the incoming sewer. This has been done at times when explosive gases were detected in the sewage. If for any reason especially desirable conditions are required in the building all of the capacity can be directed for this purpose. Under such conditions the system was designed to obtain five complete changes of air in an hour.

The main duct increases in size from 36″x30″ at the incoming sewer connection to 48″x36″ at the fan inlet. The fan discharges through



Plan and Detail of Exhaust Ventilating System for Trunk Sewer, Grit and Screen Rooms—Minneapolis-St. Paul Plant.
(The sewer enters the building through the two gate chambers on extreme right. The take-offs from the sewer draw sewer gases from behind swinging-seal baffles.)

the roof at an elevation about 60 feet above the surrounding ground.

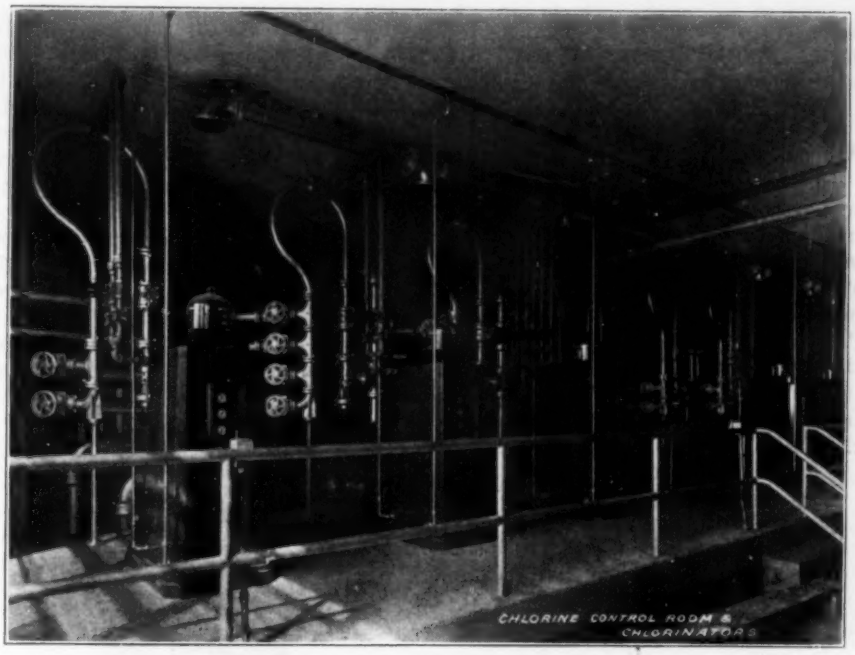
In usual operation most of the fan capacity is directed by damper settings to the incoming sewer, with a small fraction to other points. The system has worked very satisfactorily. A real test of the effectiveness of the system is made at times of discharge into the sewers of methyl acrylate from a local industrial plant. This substance is extremely volatile and has an objectionable and penetrating odor even when highly diluted. At such times odors are very marked at a number of points throughout the plant, but the screen and grit chamber building is practically free of such odors.

Sewer Ventilation

Approximately one mile from the treatment plant the main intercepting sewer crosses a series of railroad tracks at which point the sewage flows through what is commonly termed an inverted syphon. This depression in the sewer line would preclude the passage of any gas from up-sewer, and unless provision were made for the release of this air, problems would undoubtedly result from discharge of odors from the intercepting sewer manholes throughout the city. To obviate this source of difficulty a 36″ cast iron vent pipe having a length of 600 feet was installed to connect to the upper and lower end of this inverted syphon. By means of this gas by-pass line the exhaustion of air from the incoming sewer at the treatment plant tends to ventilate the entire intercepting system. In addition to preventing odors the scheme reduces the possibility of concrete disintegration, which otherwise might be marked if these gases were allowed to accumulate.

Filtration and Incineration Building

Because of the fact that undigested sludge is filtered in this plant, odors originally were quite objectionable in the sludge dewatering building. The principal source of odors in addition to the sludge exposure on the filters, were the chemical conditioning tanks which are air agitated and, although covered, permitted the escape of gases. The installation of ventilating fans in the incineration portion of the building to provide proper working conditions from the temperature standpoint resulted in the withdrawal of considerable air from the filtration room. The use of air at room temperatures for sludge incineration, instead of preheated air as formerly used, had a further indirect benefit in withdrawing additional air from the filtration building. Considerable improvement in conditions resulted from these two changes. However, the principal improvement resulted when a ventilation system was installed which attacked the problem at its source, viz., the gases discharged from the conditioning tanks. By exhausting



South End of Screen and Grit Room
(Note that the units are completely housed in)

Battery of Chlorinators with Feed Capacity from 425 Pounds to 15 Tons of Chlorine Per 24 Hours
(Secondary line of defense in odor control and for other applications as indicated)

gases from these tanks and conveying them to the incinerators, this problem was satisfactorily solved at a total expense of less than $200.00.

Incidental Odor Control Measures

It is of interest to mention several other provisions for odor control which have been incorporated in the project, or which were planned at the time of design to be included if conditions warranted. Provision has been made for prechlorination of the sewage at entrance to the plant. Also locations were selected for introducing chlorine along the intercepting sewer route should this prove necessary or desirable. To date such installations have not been needed.

In addition to provisions which can be made in the design, perhaps the best means of eliminating odors is to operate a sewage disposal plant with the odor control problem ever in mind. Scum and sludge solids should not be allowed to accumulate in channels and corners. If the design is such that these accumulations do occur, and prevention methods are difficult or impossible, periodic removal should be practiced. Sewage cannot be stored in idle tanks or non-flowing channels for more than a day or two in warm weather without producing objectionable odors. In every plant there are numerous ways of reducing the possibility of odors by proper operating technique. The superintendent or operator should always be on the lookout for such possibilities. For while even a modern, well-operated plant is not a perfume factory, it should not be placed at the other end of the scale as far as the olfactory sense is concerned, especially if minor improvement changes, or just a little added watchfulness in operation can keep it from that undesirable place.

Philadelphia Bureau Develops Integrated Chart System of Water Supply

According to M. J. McLaughlin, Chief of Bureau of Water, Philadelphia "has been systematically accumulating water supply plants and equipment since 1800," when in response to the advocacy of Benjamin Franklin the first pumping system was installed.

The present system consists of five filter plants, 13 pumping stations (five raw and eight filtered), and eight reservoirs. The city is divided into ten districts with 2500 miles of pipe delivering 314 m.g.d. Fifty-seven per cent of the water supply comes from the Schuykill River and the remainder from the Delaware River. A high pressure fire system includes separate pumps and distribution lines.

During the 143 year period since the first pumping station at Center Square, as one system was added to another and new plants were built, the distribution grids became so enmeshed that the plans of the systems were of little help in trying to ascertain the interrelations existing between the various units.

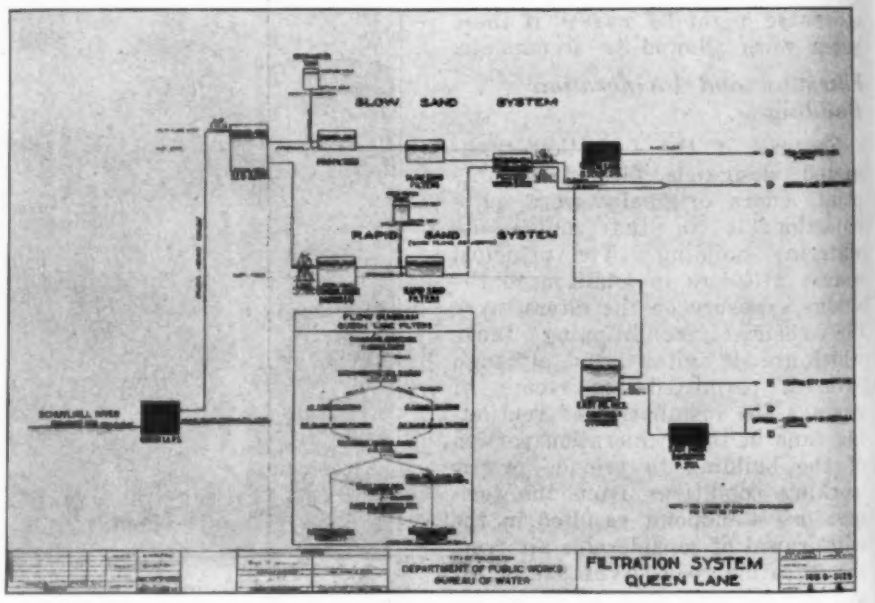
Mr. McLaughlin says that, "In order to clarify this situation, the Bureau of Water undertook in 1942 to make a complete survey—to be published in final form as a series of accurate charts and schematic drawings—to show without unnecessary details, all the filter plants with their source of supply, type of filter, associated pumping stations, and final distribution to the city under normal or abnormal conditions."

We have seen prints of these data sheets, flow diagrams, and the topographical map which make up these records. Unfortunately because of paper use restriction and the difficulty of reproducing these many drawings in a size required for legibility we are unable to present the complete series. We are indebted to Mr. McLaughlin for permission to reprint one to show the method by which Philadelphia has produced a very worthwhile permanent picturized record. Mr. McLaughlin also furnished the information contained herein.

M. J. McLaughlin

There are four filter systems, one of which is the Queen Lane, (shown in the accompanying cut). The others are the Torresdale, Roxborough and Belmont. On the drawings of each of these systems are shown the source of supply, location of settling basin, water elevations, type of filter, clear well storage, chemical dosing points, pumping stations, and points of distribution. There is a difference of 400 ft. in elevation between the highest and lowest filters. The relation between the elevations of all units is shown on one of the prints in the series. Another shows the principal data on pre-, slow-, and rapid-sand filters. The Philadelphia Bureau of Water also operates the Northeast Sewage Treatment Works, which treats 60 of the 400 m.g.d. of sewage flow in the city.

Mr. McLaughlin concludes, "The facts assembled in the survey are serving as the nucleus around which future developments by the Bureau will be planned. It has been kept in a simple schematic form, so that a quick over-all picture of the system is available at all times. . . . Many enlightening facts were revealed as the result of the survey."


SLOW SAND SYSTEM
RAPID SAND SYSTEM
FLOW DIAGRAM QUEEN LANE FILTERS
DEPARTMENT OF PUBLIC WORKS BUREAU OF WATER
FILTRATION SYSTEM QUEEN LANE

Schematic Diagram of the Queen's Lane Supply System and Filtration Plant. *(Each Philadelphia System has its separate and complete diagram of Wall Chart Size.)*

THE COKATO SEWAGE DISPOSAL PLANT

A Novel Design for Handling Canning and Domestic Wastes, Providing Low First Cost and Economical Flexible Operation

By W. E. KING*
Consulting Engineer
ST. PAUL, MINN.

THE new sewage disposal plant of Cokato, Minn., is interesting because the situation is typical of the smaller cities and villages, and because the design used is unique in many respects. The engineering profession is going to be called upon to design thousands of these plants in the near future and the problem should be restudied to see that such plants are really a good investment for the municipality.

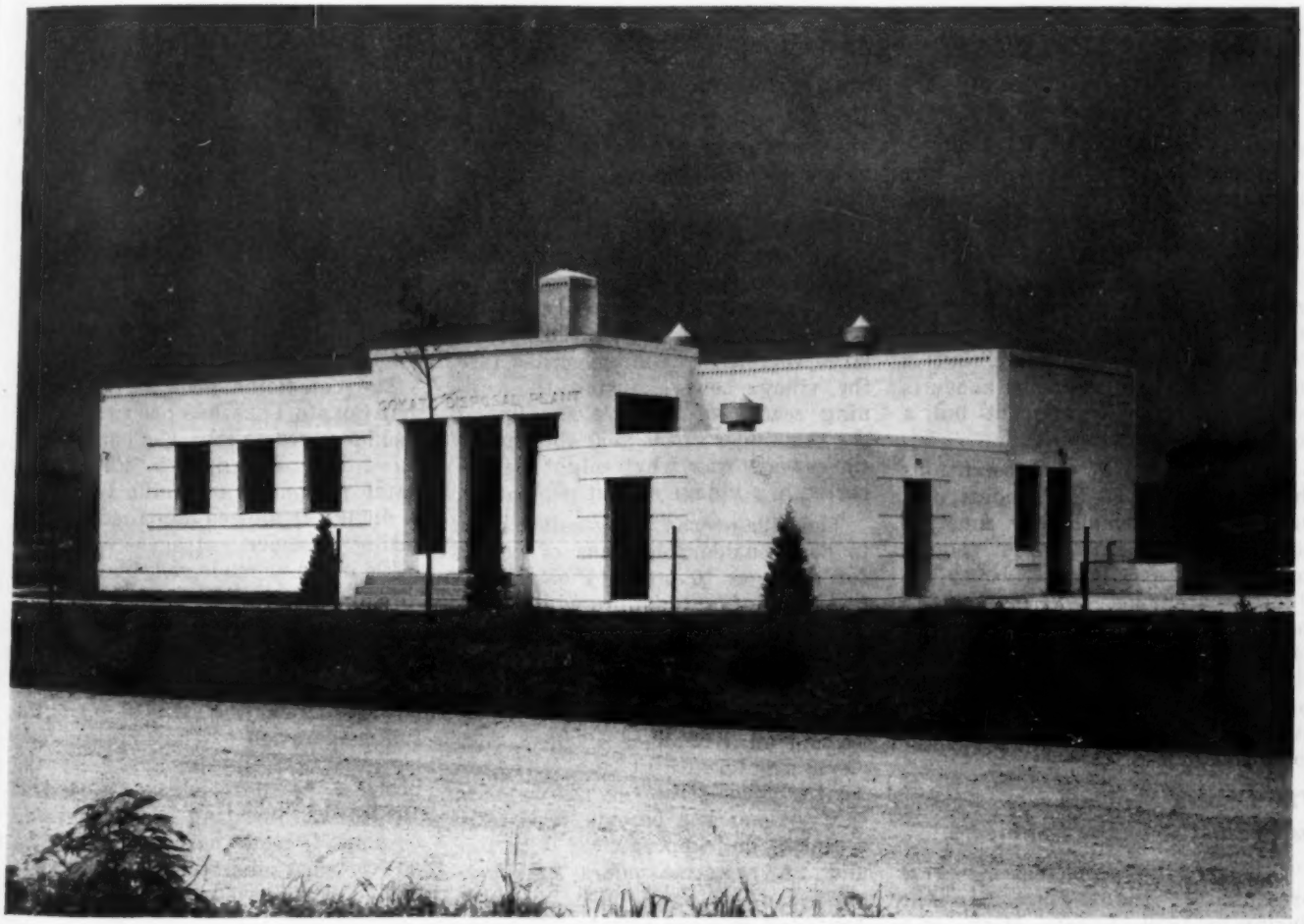
The preliminary events leading to a new plant are familiar. The problem is ignored by local authorities until the stench compels action. The State Board of Health, called in, recommends complete treatment. The village is appalled by the great expense involved. A consulting engineer engaged, confirms the bad news and probably follows along the lines laid down by the state health authority.

The Author

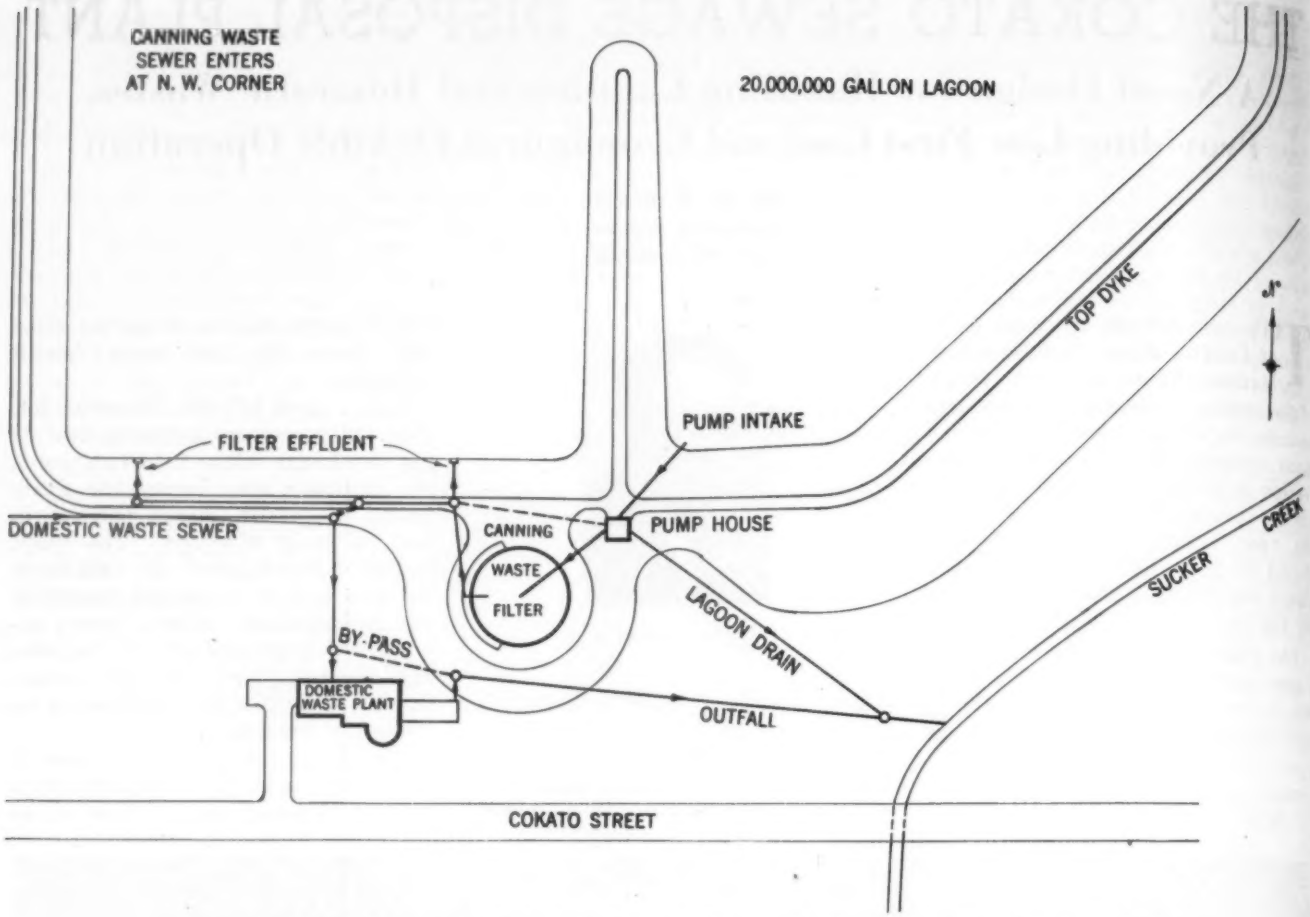
A new plant is built. It costs a lot. The village street commissioner is put in charge without instruction—the engineer goes home—the State Board of Health leaves the operation to local direction. The plant rapidly depreciates in efficiency through lack of intelligent operation and maintenance. After a year's operation a large majority of the sewage disposal plants are not producing anything like the purification intended or necessary.

The depreciation of equipment is extremely rapid. We find plants with motors burned out, chlorinating

*Toltz, King and Day, Inc., Engineers and Architects.



The Sewage Treatment Plant of Cokato, Minn.
Neat, Compact, Economical and Architecturally Worthy; Was by us Dubbed 1942's Version of "A House by the Side of the Road," and Pictured on the Front Cover of our Annual Sewerage Review Issue, February, 1943.



General Plan of the Interlocking Industrial and Domestic Waste Treatment Works of Cokato.

equipment unused and inoperative, settling tanks full of sludge, and filters clogged, ponded and by-passed. This we would say is very "secondary" treatment.

A sewage disposal plant operating properly is a good investment paying generous dividends in health and comfort in the community, but a plant operated as described above is not only a poor investment but a menace to the community.

The possibility of such conditions should be recognized in the design of the plant. The small plant must be designed to operate even though neglected or else it must be so designed that neglect will become immediately apparent and necessarily be corrected at once. The Cokato plant meets the latter condition. It is offered as a reasonably successful attempt to recognize and meet such conditions.

The Cokato Problem as Presented to the Engineers

Consider the problem as it was presented to the engineers in the Spring of 1940. Cokato, Minn., is a village with a population of 1,200, located in a rich farming area some 60 miles west of St. Paul. A combined sewerage system serving part of the village discharged into Sucker Creek and thence into Cokato Lake two miles downstream.

Two large canning plants operated by the Minnesota Valley Canning Company and the Northland Canning Company, respectively, discharged a large volume of canning wastes into the village sewers during the canning season of six weeks. During the remainder of the year the domestic sewage was what might be expected in a village of that population.

The village was being called upon to pay considerable sums of money for damages to property owners as the result of lawsuits brought in District Court. Extracts from the legal complaint describe the situation:

"That before the dumping of said sewage and wastes . . . there flowed therein an abundance of clear, cool, clean and healthful spring water. That by reason thereof, the water in said stream has become filled with sediment and impregnated with foul and unwholesome odors and substances. That same have . . . been deposited in Lake Cokato. That the stream is definitely polluted with municipal wastes before the canning season and that the cannery wastes, which in late summer are annually superimposed upon other wastes dumped into the stream by the defendant, produce a total organic load which far exceeds any capacity for self-purification . . . rendering the stream unfit for many types of aquatic life, including fish, and making it a nuisance. . . ."

The complaint goes on to recite that Cokato Lake has been ruined as a summer resort lake, the bottom and shore line fouled, fish killed, the water poisonous and unfit for cattle to drink. It alleges damages by rendering summer cottages unsalable, cattle killed or made sick by drinking water, milk contaminated.

Judgments and expenses of about $9,000 resulted, with other claims unsettled.

Fortunately the village had the full cooperation of the canning companies in attempting to meet the problem. While the State Board of Health was insisting that something be done, it made no recommendation as to what methods or processes should be followed.

Choosing the Process

Toltz, King and Day, Inc., engineers for the village, made rather an

extended study of the problem and found no record of the successful operation of sewage disposal plant handling corn wastes. It developed that Dr. H. O. Halvorson of St. Paul, consultant for the Minnesota Canners Association, had been studying the problem for a number of years and had developed a process that offered considerable probability of success. The system finally decided upon was developed under Dr. Halvorson's direction, and the engineers claim little more than intelligent amplification of the plan suggested.

Among the methods tried elsewhere and here considered might be mentioned the following:

1. The direct treatment of the canning wastes using lime and iron salts. This method was rejected on the ground of high operating cost. It was also determined that the effluent would have a B.O.D. of 500 p.p.m., which would still constitute a nuisance.

2. The construction of a standard type of sewage disposal plant to treat both domestic and canning wastes. Such a plant, consisting of primary sedimentation, first and second stage trickling filters, sludge digestion tank and chlorination, would have cost at least $150,000 if made large enough to handle the volume of sewage delivered during the canning period. This may be compared with a cost of $50,000 for such a plant to handle domestic waste only. Full scale tests of such a plant at Fairmont, Minn., showed that where the corn waste volume exceeded the domestic wastes, the treatment was ineffective and unsatisfactory.

3. Consideration was given to the addition of sodium nitrate to the canning waste and its storage in a lagoon from which it might be discharged during periods of high water. This method was rejected as being too expensive in operation.

4. Experiments by Dr. Halvorson indicated that a method being used at Crystal Lake, Ill., for the wastes from a yeast plant offered convincing indications of success. In this plant the wastes are stored in a lagoon. To reduce their strength and remove the odor nuisance, the lagooned waste is continuously recirculated through a high rate trickling filter and returned to the lagoon. While the plant at Crystal Lake is operated continuously, the Cokato plant would receive sewage only during the canning period. If the odor nuisance could be controlled and the B.O.D. sufficiently satisfied, then the stored waste could be discharged from the lagoon in the spring during high water.

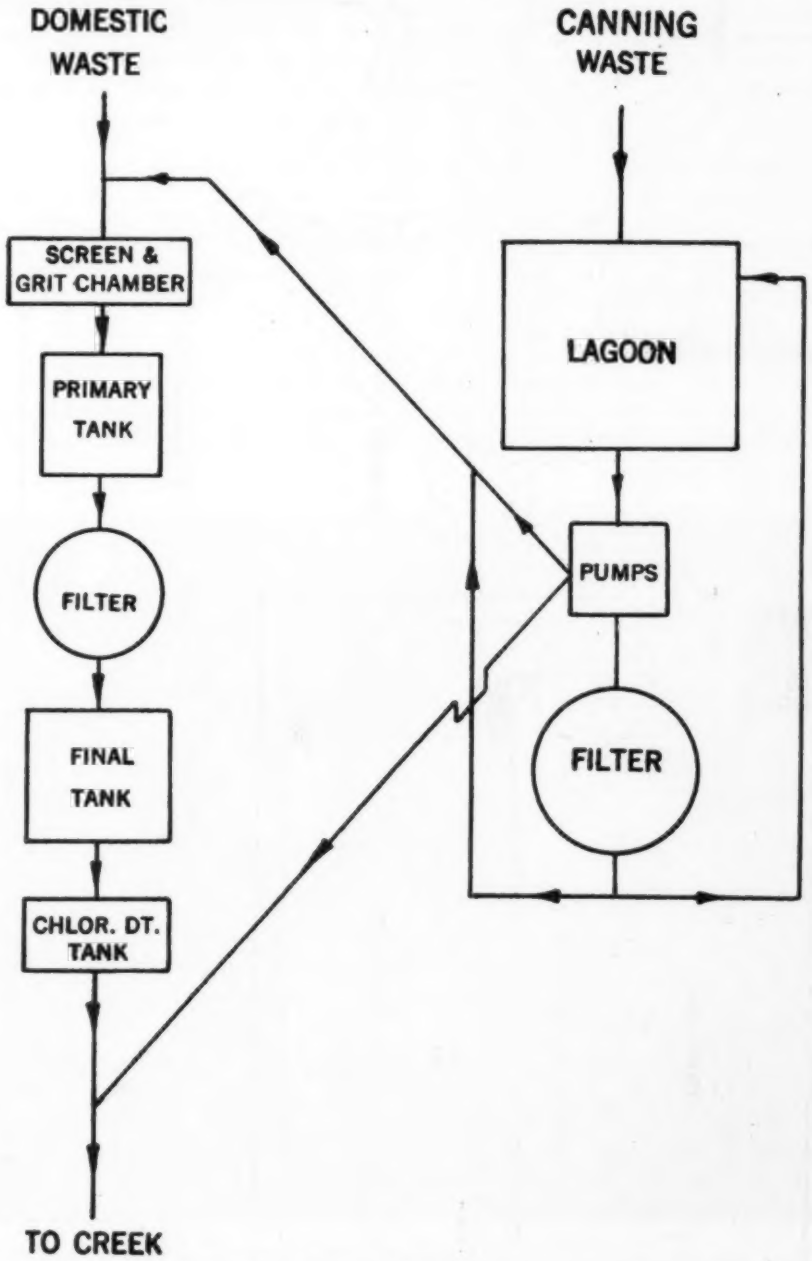
The Scheme Adopted

The plan proposed was carried out in the Spring of 1940. A separate sewer about a mile long was constructed for conducting the canning wastes to a storage lagoon having a capacity of 20,000,000 gallons. The flow diagram and method of handling is indicated in an accompanying drawing.

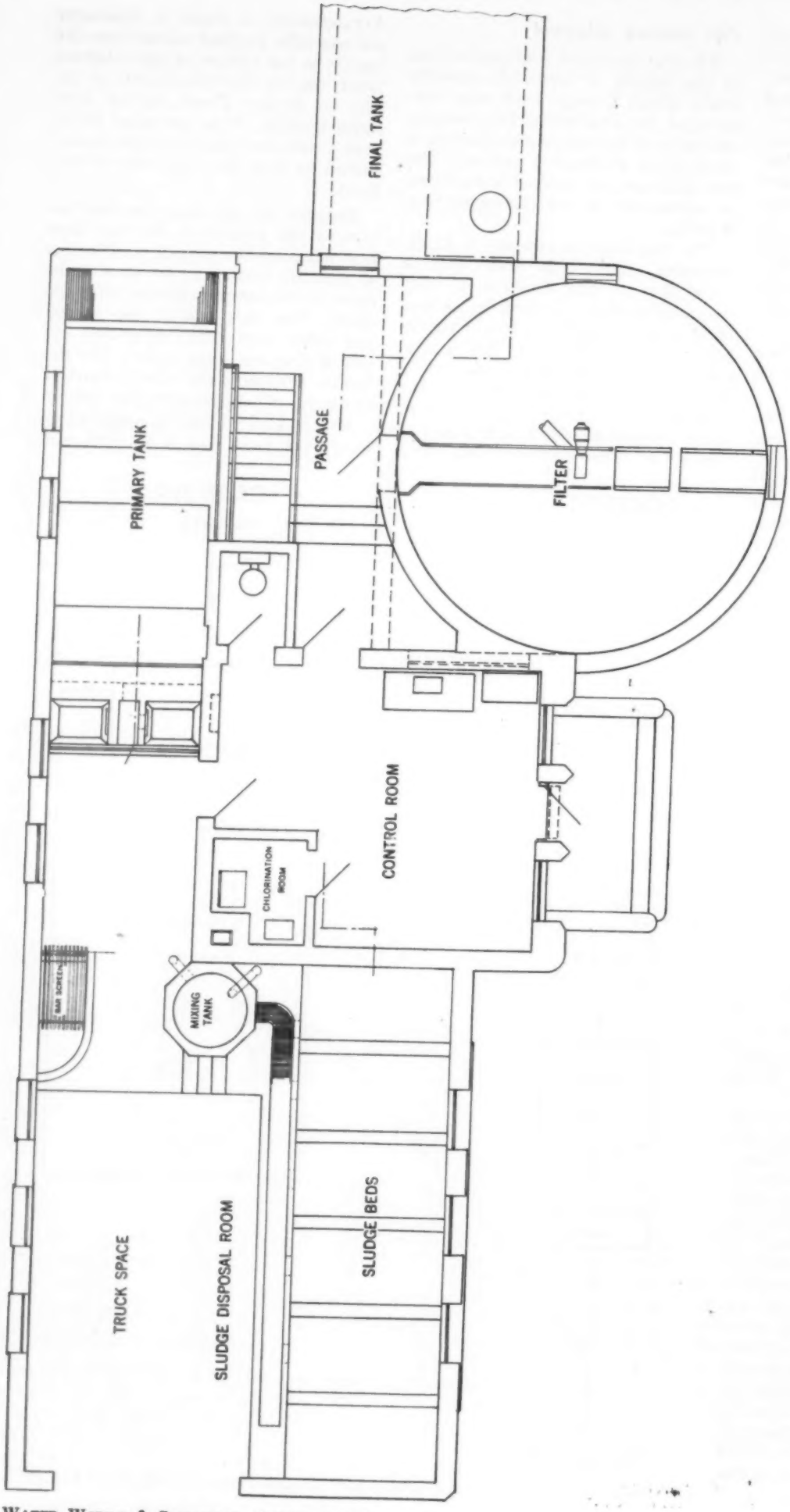
The operation is simple. A 61 ft. diameter, high rate filter with a novel type of tile media 4 ft. deep was constructed. A pump house was built and equipped with two centrifugal pumps, each with 700 g.p.m. capacity, to recirculate the waste through the filter and back to the lagoon. The lagoon is so arranged as to prevent short circuiting and to secure a reasonably uniform flow. Arrangement is made to discharge the partially purified waste from the lagoon to the village sewage disposal plant for further treatment, or direct to Sucker Creek during high water periods. This provision determined that the location of the lagoon should be near the domestic sewage plant.

Because of the experimental nature of the project it was not clear how much of the overall purification of canning wastes would have to be done in the domestic sewage disposal plant. For this reason the lagoon and filter were constructed and operated for one year before the domestic sewage plant was completely designed and its construction begun.

The lagoon was built using earth excavated from the site. The soil



Flow Diagram of Canning Waste and Sewage Treatment Plants of Cokato.



Floor Plan of the Cokato Sewage Treatment Plant.
(To fit this space the Final Tank could not be reproduced in full length.—Ed.)

was analyzed and the dikes were built in layers using a controlled moisture content and compacted with sheepsfoot rollers. As an illustration of the satisfactory results obtained, it was observed that there has been no leakage through the dikes. The 61 ft. filter was constructed resting upon some 10 ft. of this fill and has shown no settlement after three years' operation.

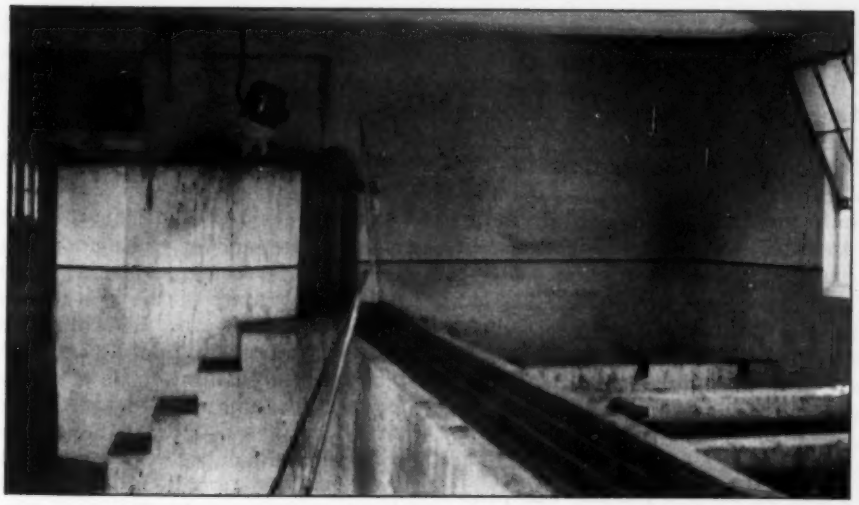
The filter, a concrete shell, is built for a 6 ft. depth of the media. However, only 4 ft. of tile were installed. These tile, manufactured by the Red Wing Sewer Pipe Co., were used because of the acid character of the corn waste. The tile design, providing for 1 in. holes extending from top to bottom (see sketch), prevents ponding and short circuiting in the filter, a difficulty which has been encountered in crushed rock filters.

The filter distributor is of the reaction type, with a large number of nozzles to give a continuous uniform distribution over the entire area. It was decided to omit any enclosure over the filter during the experimental period, the roof having been subsequently added.

Some Operating Data

During 1940, the first year of operation of the canning waste treatment plant, a total of 16,600,000 gallons of waste was discharged to the lagoon. This figure includes about 1,000,000 gallons each of rain water and silage stack drainage. Of the total of 550,000 pounds of 5 day B.O.D. of this waste, 240,000 was from the silage waste. This total waste was from a season's pack of 390,000 cases of No. 2 cans of corn, both cream style and whole kernel. During the season, the maximum volume of waste in the lagoon at any one time was 6,200,000 gallons. It is estimated that 5,000,000 gallons evaporated and that 9,200,000 gallons seeped away up until Nov. 11, 1940, when the plant closed down for the winter. At this time 2,400,000 gallons remained in the lagoon. A reasonable assumption on the seepage is that the waste that seeped away had the same B.O.D. as that in the lagoon. This gives an assumed loss in pounds of B.O.D. from seepage of 160,000. The remaining 370,000 pounds or more of B.O.D. was removed by the filter, converted to solids and settled out or digested in the lagoon. On Nov. 11, 1940, there remained 20,000 pounds of B.O.D. in solution in the lagoon, representing a residual of only 4 per cent of the total B.O.D. received.

During the first year's operation there were several days when the odor was very objectionable. This resulted largely from the spray of the filter which allowed a high degree of



Chemical Conditioning Tank and Sand Beds for Denaturing Undigested Sludge.

The "Aero-filter"—Looking Down on the Tile Media.
Beneath the motor is the impeller type distributor employed in the low diameter "Aero-filters."

evaporation and the release of odorous gases to the atmosphere.

To correct this difficulty, the filter was housed in the Spring of 1941. An exhaust fan was provided to give added air circulation through the filter. Provision was made to chlorinate the exhaust air and discharge it to a duct extending above the roof a short distance.

The operation during 1940 was entirely satisfactory except as stated above. It showed that further treatment of canning waste in the domestic plant would not be necessary except under unusual conditions.

During the year 1942 plant waste totaling 22,300,000 gallons was processed. This resulted in a greater volume of stronger wastes in the lagoon at all times. At the start of winter there were 5,500,000 gallons in the lagoon with a 5 day B.O.D. in the liquid contents of 108,000 pounds. No serious odor nuisance resulted and the lagoon was emptied this Spring (1943) during high water without damage to the stream or any nuisance developing.

Each year the filter was operated from the start of canning operations until about Nov. 5. At constant rate 2,000,000 gallons per day were recirculated through the filter from the lagoon.

Costs

The cost of the canning waste disposal plant, including lagoon, pumps, pump house and trickling filter, was $45,000.

The cost of operation runs between ¾ and ⅞ cents per case of No. 2 cans, including fixed charges, labor and electric power. This appears to be a reasonably satisfactory cost.

The Domestic Plant

In the winter of 1941 plans were prepared for the domestic waste treatment plant and an intercepting sewer to collect the domestic wastes from the three widely separated sewer outlets. A study of the problem indicated that a two mile intercepting sewer could be built without lift stations and the domestic plant could be constructed with gravity flow through it. Diversion manholes were constructed at the three sewer outlets to divert excess storm water direct to the Creek during storms. It was recommended that the village proceed to separate the domestic waste from the storm sewer system and construct separate sanitary sewers. This program is now under way.

The customary domestic sewage disposal plant in Minnesota would include primary sedimentation, trickling filter, final settling with provision for chlorination, sludge digestion and sludge drying beds. The cost of such a plant is estimated in this case to be $50,000.

Typical designs for such a plant would locate each of these facilities in a separate structure arranged to fit the topography of the site or the ideas of the designer. In Minnesota it is good practice to house over most of the units. The result is a group of small buildings which add nothing to the appearance of the neighborhood. The difficulties of combining the structures in one building will occur to any engineer familiar with such plants. Such difficulties are largely structural.

There are certain advantages to be gained by combination in a single structure. The operator does not have to go outdoors to oil and service equipment, take samples and do other maintenance work. This will perhaps mean better operation and less neglect.

Heating and ventilation of a combined plant is much simpler. This is important in cold climates.

Finally, one building can be constructed having sufficient size to present some architectural importance and character. Perhaps the community will then feel some pride in their plant and will want it properly maintained.

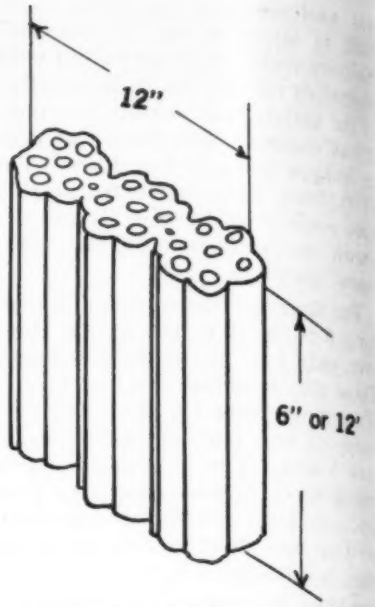
The comparative cost will depend upon local conditions, but in this case was no greater.

The engineers have felt for some time that the expenditures required of villages for sewage disposal plants are excessive. For this reason, a study was made by the engineers to see if a type of plant might be used which would result in some economy. The River Falls process was finally selected, which resulted in a first cost of $37,500 or a saving of 25 per cent.

This plan eliminates the sludge digestion tank entirely. Raw sludge is chemically conditioned, dewatered on covered sand beds and hauled away for fertilizer.

The following is a comparative statement of the annual charges, including fixed charges, maintenance, labor, and chemicals used:

	Conventional Plant	River Falls Process
Fixed Charges at 7%	$3,500	$2,625
Plant Operator	300	600
Ferric Chloride	0	150
Chlorine	150	150
Sludge hauling	25	180
Heating	100	100
Power and Light	100	150
Maintenance	600	400
Total	$4,775	$4,355



Sketch of a Filter Media Tile. (*Installed vertically—see picture of filter.*)

Because this plant requires an operator several hours each day it is believed that it will be better maintained than a plant that is left to run by itself several days or sometimes weeks. The sludge digestion tank, which is the source of most of the trouble in many plants, has been eliminated and a simple manual process substituted.

Basis of Design—

The basis for the design for this domestic sewage plant is a connected population of 1,400 with a sewage flow of 80,000 gallons per day of sanitary wastes with a B.O.D. of 350 parts per million and suspended solids of 250 parts per million. The units of the plant were sized liberally to give some added capacity in the event further treatment of canning waste proves necessary.

The primary tank is designed to give but one-half hour detention for a total flow of 320,000 gallons in 16 hours during storms. Provision is also made for by-passing excess flow ahead of the high rate filter.

Sewage enters the plant through a hand-cleaned bar rack and grit chamber and then flows to the primary settling tank, which is equipped with mechanical equipment for the collection of sludge and skimming of tank surface.

The effluent from the primary tank flows to the 20 ft. diameter high rate filter. This filter has a 6 ft. depth of tile media and operates at a normal rate of 18 million gallons a day. It is capable of operating at 26 million gallons a day and will work sat-

isfactorily on a minimum flow of 9 million gallons a day.

For amounts smaller than this it is arranged to recirculate the effluent by means of a recirculation pump.

The disc distributor is power driven and provides a uniform rain-like distribution which is necessary for high capacity filters operating at all rates of flow.

As shown in the accompanying flow diagram, the effluent flows from the filter to a secondary tank also equipped with mechanical means of collecting sludge and skimming the tank.

Provision is made for chlorination with a detention tank, whence the effluent is discharged into Sucker Creek.

Sludge Disposal Without Digestion

Sludge from both settling tanks is pumped to a concrete mixing tank, where it is conditioned by the addition of 5 per cent of ferric chloride. This chemical coagulates and deodorizes the sludge, which is then discharged upon one of six sand filters located in the building. After drying, the sludge is practically odorless and may be used as fertilizer on farm land.

The entire domestic sewage treatment plant is housed in one reinforced concrete building. The architectural treatment is typical of the special purpose of the plant but results in a building of very satisfactory appearance.

Compact Arrangement of Units

Referring to the plans, one enters the plant through the control room, which houses electric controls, the chlorination equipment, the laboratory and office. The door at the rear leads to the operating space over sewage intake with the open top of the primary tank to the right.

On the left is the sludge mixing tank and the six sand filters. Space is provided for one truck, which will be used in hauling away the sludge.

To the right of the control room is the upper part of the aero filter (enclosed). Going down the stairs we come to the filter gallery with the pump room beyond. This room houses the sludge pump, the recirculating pump, the wash water pump and the chlorinator water pump, as well as the oil fired boiler. Going to the right along the filter gallery we come to the top of the final settling tank, housed over for winter operation, with the chlorine detention tank at the other end.

The compact arrangement of the plant permits heating and ventilation at moderate expense.

The disposal building is heated by means of a low pressure steam gravity system of heating, consisting of an oil fired steam boiler supplying steam to radiators and a forced air heating and ventilating machine, through a system of piping. The ventilating machine heats and ventilates building spaces where objectionable odors prevail. The supply air from this unit is distributed through ducts to the areas to be heated. The entering air to the machine is made up of return air from the heated spaces and outdoor air in the proportion of two-thirds and one-third, respectively. The excess or one-third remaining return air is exhausted through roof ventilators.

The ventilating machine is provided with automatic control to maintain a room temperature of 50 degrees or more if desired. A mixing damper control adjusts the quantity of outdoor air desired or make up air, and is designed for automatic or manual control.

The filter room is ventilated by means of a small supply air fan taking its air supply from the heated spaces of the building and discharging the same through duct work to the filter structure.

The domestic sewage plant of Cokato has now been operating for a year. The operation appears to be satisfactory. The water in the creek is now clear and the farmers below are well satisfied.

The design and construction of the plant were in charge of A. J. Duvall, sanitary engineer, and Roy H. Haslund, architect, for Toltz, King and Day, Inc.

The canning companies were represented by Dr. H. O. Halvorson of the Department of Bacteriology and Immunology, University of Minnesota.

The mechanical equipment was furnished by the following firms:
"Aerofilter" Distributor....Chain Belt Co.
Chlorinators.....Wallace and Tiernan Co.
Filter Tile.....Red Wing Sewer Pipe Corp.
Sludge Collecting Mechanisms.....
.....Chain Belt Co.
Piping and Mechanical Equipment.....
.....Grinnell Co.
Sewage Pumps (American Well Works)
.....American Radiator and Standard Sanitary Corp.

The general contractor for the lagoon was Feyen, Preston and Welch of St. Paul. The general contractor for the canning waste filter and pump house and for the domestic sewage plant was C. G. Victorson of Minneapolis.

The village officials at the time of the construction of the plant were:

Mayor—Menser Johnson.
Village Recorder—Luther Peterson.
Councilmen—D. C. Johnson, A. W. Nelson, C. M. Swanson.
Village Attorney—Clifford Olson.

"Bill" Hansell of Atlanta Dies

William A. Hansell, Ass't Chief of Construction for the City of Atlanta, Ga., died on Sept. 9. In his three score years and ten, Mr. Hansell had performed many services to his community and his profession. A member of the Am. Soc. C. E. he had been president of the local section. A graduate of Georgia Tech, who received a gold "T" in later years for his services as a lecturer at his Alma Mater, Mr. Hansell had been a frequent contributor to many engineering publications.

In the field of sanitary engineering, Mr. Hansell was best known for his work as a leader in the development of the sewerage system of the city of Atlanta. He was active in his church, and in various business organizations and enterprises. Mr. Hansell is survived by his widow, two sons, and five daughters, one of whom is Mrs. Van Porter Enloe, wife of Atlanta's Superintendent of Sewage Treatment and Secretary of the Georgia Water and Sewerage Works Association.

Wm. A. Hansell

Costs of Operating Public Works

"Municipal Public Works Service Expenditures and Appropriations" have been catalogued by the American Public Works Association in a new bulletin of value to municipal authorities and public works officials.

This bulletin provides a summary of expenditures and appropriations for street maintenance and repair, street cleaning, snow removal, refuse collection and disposal, sewer maintenance, sewage disposal, and other public works activities in selected cities. These cities, one hundred forty in number, have populations over 10,000. The tabulations include quantitative and financial information covering the years 1940-41-42-43.

A REVENUE PLAN FOR SEWAGE WORKS FINANCING

By JOHN A. GOETZ
Superintendent
WATER AND SEWER DEPTS.
MATTOON, ILL.

The Author writes, "I have noted this subject has been covered in various articles, in a general way, but this one treats of a specific case". We believe that this rather unique method of arriving at a sewer service charge will be of interest to both large and small plant managers.—G. E. S.

THERE are so many legal ways in which the "people" can prevent the impositions of the modern life—the construction of sidewalks, paving of streets, disposal of waste and other improvements—yet often it must be done the hard way. This applies particularly to such undertakings as sewage disposal, a very unpopular subject in certain localities, especially when politicians take up the cause and "protect" their constituents from being imposed on. It would probably be better to organize a district, particularly where territory outside the corporate limits of a city are served, but when this is not possible, a revenue method (which requires no referendum) is a way out. It is such a plan of financing, with which we are concerned.

Rate Structure

In order to set up rates sufficient to furnish income to meet operating expense, retire bonded debt and provide for depreciation of equipment, a study of water use was made. The writer had never been satisfied with a straight sewerage charge, based on water use alone. Especially of concern is the penalizing effect of a high rate for water use, for all domestic purposes, while the nominal users, living in apartments and flats, benefit at the expense of the householder. Water used for lawn sprinkling, gardens, pools, etc., never reaches the treatment plant, and any extra charge becomes a punishment for the use of water. On the other hand, the apartment and hotel dweller, especially the conservative user, will produce just as much sewage with much less water use. The study disclosed that more than three-fourths of all charges would have to be levied against homes, apartments, hotels and rooming houses and very little against industries. On account of this predominance it seemed logical to consider the individual home, or family, the unit for a basis.

It was assumed that with a house or apartment occupied by a family, or equivalent, there was no reason to take fixtures into account, unless more than one family resided there, or rooms were let. It does not matter how many baths or other appliances there are to serve the single family. However, even if there be only one bath on premises occupied by a family and roomers, or two families, then the minimum charge should increase in proportion. It can readily be seen that this will result in many higher minimum billings, than would be the case if only a regular minimum were applied to each water service. The billing for each service then will be as many times the minimum as there are family units served by same. Rooms in hotels and rooming houses are billed at one-fourth of a family unit. Private toilets in stores, offices and other establishments are treated the same as family units. Toilets accessible to the public such as in publice buildings, taverns, service stations and the like take a double minimum. Any mercantile or industrial establishment is billed one minimum for private toilet and one-twelfth the minimum for each employee above four.

The minimum billing is for one month and is based on the use of 400 cu. ft. (3,000 gallons) of water use. This seems to be a fair assumption as about 85 per cent of customers come within this range. When more water is used, charges for sewerage increase at the rate of one-third of water billing, up to 1,600 cu. ft., after which the rate decreases. The step rates do not benefit the user of larger quantities of water until the minimum billing is passed.

Sounds Complicated?

It is not so bad if you get started off on the right foot. A survey of structures and installations, and an index are necessary, but there are a number of good reasons why you ought to have that any way. You will then know who has connections to sewers, who maintains outside toilets, who uses private wells, who has private water systems and a multitude of things you have been wanting to know. This is also a good way to find out more about your neighbors. The Mattoon form is reproduced in Fig. 1, but that would not suit you, so get up your own.

Such a survey gives all required information to set up a definite minimum for each water user, directly on the meter sheet from which billing is done. The records are kept up to date from permits issued under building or plumbing code. If

CITY OF MATTOON—WATER & SEWERAGE DATA

STREET..... Number..... Lot..... Block..... Addition.....

WATER.. Public..... Service line size..... Meter size..... Private well: Type..... Power pump .....

SEWER Connection Direct..... Downspouts..... Drainage Dist.....
Cesspool..... Connected.....

STRUCTURES Type..... Private.....
Use..... Public .....

RATE Per month, minimum ..... Date This record.....19.....
Alterations.....19.....

CLASSIFICATION

DOMESTIC	MERCANTILE	INDUSTRIAL
Residential - - - - - - ☐	Store or Office - - - - ☐	Factory or Shop - - - - ☐
Church - - - - - - - ☐	Barber or Beauty Shop - - ☐	Greenhouse - - - - - - ☐
Hospital or Institution - - ☐	Garage or Service Station - ☐	Laundry or Creamery - - ☐
Hotel or Rooming House - ☐	Restaurant - - - - - - ☐	Packing Plant - - - - - ☐
Lodge Rooms - - - - - - ☐	Tavern, Soft Drink Est. - - ☐	Poultry House - - - - - ☐
..... ☐	..... ☐	..... ☐

Public Toilets	Floor Drains	No. Family Units	No. Employees .....
Private Toilets	Slop Sinks	No. Rooms Each	No. Pupils .....
Bath or Showers	Restaurant Sinks	Hosp. or Inst. rooms	No. Inst. Occupants .....
Lavatories	Wash Racks	Hotel rooms to rent	.....
Kitchen Sinks	Barber Chairs	Rooming, rooms to rent.....	.....

If additional data is available, list on back and check here ☐

Fig. 1—Form for Survey Data on Water and Sewer Service

CITY OF MATTOON—WATER AND SEWER DEPTS.
12th St. & Marshall Ave. MATTOON, ILLINOIS City Clerk's Office
"Above all, it's a safe water"

METER READINGS	
Present	Previous
147	143

This bill covers services to [redacted] MAR 9 / MAR 9

SYMBOLS
Wtr.—Water charge.
Swr.—Sewer rental.
Tot.—Total combined bill.

Nov. 1, 1942

10 per cent penalty will be added to and collected if unpaid by due date, November 16, 1942.

USED 100 cu. ft.	NET BILL
4	144 WTR
	48 SWR
	192 TOT

Nov. 1, 1942

NET BILL
144 WTR
48 SWR
192 TOT

Bring bill with you, or inclose stub when paying by mail.

Rates for Water Used During Each Month per 100 cubic feet.

Untreated Water		Treated Water	
For first	533 cu. ft. 31½c	For first	1,337 cu. ft. 36 c
Next	800 cu. ft. 19 c	Next	65,513 cu. ft. 13½c
Next	6,665 cu ft. 11½c	All over	66,850 cu. ft. 7½c
Next	18,666 cu. ft. 9 c		
Next	26,666 cu. ft. 8 c	Sewer Service	
Next	80,000 cu. ft. 7½c	For first	1,600 cu. ft. 12 c
Next	133,333 cu. ft. 6¾c	Next	8,400 cu. ft. 8 c
Next	266,666 cu. ft. 6 c	Next	40,000 cu. ft. 4 c
Next	800,000 cu. ft. 5 c	Next	350,000 cu. ft. ½c
All over	1,333,329 cu. ft. 4¾c	All over	400,000 cu. ft. ¼c

Minimum Monthly Bill: Water 90c; Sewer Service 48c

Audit Sheet (Posting)

MAR 9				SWR
				00
				TAX
				00
MAR 9	90	48	09	04
MAR 9	1 80	60	18	06
MAR 9	2 16	72	21	07
MAR 9	90		09	
MAR 9	1 80			
MAR 9	1 80	60	18	06
MAR 9	3 60	1 20	36	12
MAR 9	2 88	96	28	09
MAR 9	1 08	48	10	04
MAR 9	2 52	84	25	08
MAR 9				
				SWR
	19 44		1 74	
				TAX
	5 88		56	

Shows separate totals for water, water penalty, sewer and sewer penalty.

Fig. 2—Bill Showing Meter Reading, Charge for Water and Sewer Service, and Total Charge

Fig. 4—Audit Proof Sheet from Billing Machine

another department issues such permits, duplicates of same, or periodic checking of records will not entail much work. In making the survey and index, reference should be to premises, as owners come and go, but the premises stay. Where water and sewer departments are operated jointly, there is no reason why service line records, locations, etc., can not be carried on the same cards.

Joint Billing of Water and Sewer Charges

This is not a treatise on the art of bookkeeping by a learned accountant but rather a description of a very simple method of customer billing and accounting, jointly as far as equipment, bills and ledger are concerned but separately as to water and sewer accounts. And the bills show meter readings, use, separate amounts for water and sewerage, totals, all on a lowly government post card Fig. 2.

The meter readers' sheet, Fig 3, was set up to show the usual readings, consumption and charges for both water and sewers, with the minimums prominently placed at the head of sheet. For water, the minimum is based on meter size; for sewerage, it depends on installation, number of families, public building, etc. The operator sees at a glance whether water use or minimum applies. Post card bills are addressed by machine. Account numbers are by route number and consecutive numbers separated by a dash.

Billing Operation

Bills are arranged in route groups, totals taken for both water and sewerage and checked against audit, or proof sheet, (Fig. 4), from the billing machine. This machine has a "split" keyboard enabling separate totals for water and sewerage billing and will at the same time total the two items on bill and stub. The ledger sheet, Fig. 5, is arranged in columns for use or consumption, amount for water, amount for sewer, date, meter readings, water paid, sewer paid, water penalty paid, sewer penalty paid and still a small column for remarks! No one thought of anything else to put on it.

As only from 10 to 12 per cent of bills are usually delinquent, no stubs are prepared for same at the time of billing. This is taken care of near the end of month by listing unpaid accounts for action by the collector. Incidentally the ten per cent penalty imposed, little more than pays for the extra labor involved. The actual operation of billing takes nearly twice as long as it did for water alone for there are more motions to perform. However, since all other functions involve no extra time, there is no question of a great saving of time, labor and accounting outfits.

Posting

As payment is received, the stub showing both water and sewer payments, penalties if any, is kept, and again separate totals are taken. The audit sheet, Fig. 6, from the machine once more, must tally and the operation is complete. Posting is

JOHN M. RICHARDSON

1313½ BROADWAY AVE. 4-169
MATTOON, ILL.

CURB BOX LOCATION & NO. 3072
METER LOCATION 2' N of N lot 1 E of walk

METER No.	MAKE	SIZE
606372	TRIDENT	⅝
MIN. 90		MIN. 48

DATE	READING	CU. FT. CONSPT.	WATER CHARGE	SEWER CHARGE
JULY				
JUNE				
MAY				
APR.				
MAR. 9	14762	4	1.44	48
FEB. 9	14322			
JAN.				
DEC.				
JULY				

If Lost Return to Water Department, City of Mattoon.

Fig. 3—Meter Reader Sheet. (Entry Spaces Are Provided for 24 Months)

CITY OF MATTOON WATER AND SEWER DEPARTMENTS

JOHN M. RICHARDSON

1313½ BROADWAY AVE. 4-169
MATTOON, ILL.

USED	AMOUNT WATER	AMT. SEWER	DATE	READINGS	PAID WATER	PAID SEWER	PAID PENALTIES WATER	PAID PENALTIES SEWER	Remarks
4	1 44	48	MAR 9	1 47	1 44	48			

Fig. 5—Ledger Sheet. (16 Entry Lines—Same Form on Reverse Side)

Audit Sheet (Billing)

	MAR 9			
	MAR 9			WR
	MAR 9			00 †
	MAR 9			WC
	MAR 9			00 †
	MAR 9			TM
	MAR 9			00 †
	MAR 9			SR
	MAR 9			00 †
	MAR 9			MS
				00 †
4 27	4 24			00 TM
	MAR 9		3	1 08 WR
	MAR 9			48 SR
				1 56 TM
6 75	6 70			
	MAR 9		5	1 80 WR
	MAR 9			60 SR
				2 40 TM
1 83	1 81			
	MAR 9		2	90 WR
	MAR 9			48 SR
				1 38 TM
1 24	1 16			
	MAR 9		8	2 88 WR
	MAR 9			96 SR
				3 84 TM
1 33	1 22			
	MAR 9		11	3 96 WR
	MAR 9			1 32 SR
				5 28 TM
	MAR 9			WR
	MAR 9		29	10 62 †
	MAR 9			WC
	MAR 9			00 †
	MAR 9			TM
	MAR 9			00 †
	MAR 9			SR
	MAR 9			3 84 †
	MAR 9			MS
	MAR 9	15 42		15 13 †
				00 TM

Shows separate totals for water, sewer, 100 cu. ft. consumption

Fig. 6—Posting Audit Sheet

done directly from stubs, and totals only are entered in cash book. Miscellaneous charges are handled in a separate ledger and are entered as individual items on cash book when payment is received.

Entries for total billing for each month are taken from audit sheets, as are consumption records. Penalties are noted on stubs when received and posted on ledger sheets together with regular charges. Entries for total receipts are taken from audit sheets as was the billing.

Justification for Procedure

After eighteen months of operation, the writer feels that the ends sought have been accomplished. Considering cost of operation and amortization of indebtedness, rates and minimum billing (48 cents per family unit per month) are low and water use has not decreased on this account. It is a most equitable method, reaching all who should pay for such service, even those who maintain their own water supply. The records set up will be valuable in the future in a variety of ways and once set up, the system is not in the least complicated.

In this eighteen month period under this system with about 3,800 accounts, there has been no desire to make any changes. The method is not troublesome, is accurate and most economical. The same force that formerly handled water accounts alone is now doing both with little more effort. While all this is on a small scale, there is nothing to hinder its application on an expanded scale for a larger city. Perhaps it would then be better to adopt a quarterly instead of a monthly billing period.

Pitometer Co. Founder Receives AWWA Honorary Membership

On September 27th, at a luncheon arranged by friends, E. S. Cole, founder and long-time president of The Pitometer Co. of New York, was the honor guest. The occasion was the presentation to him of the Certificate Honorary Membership in the American Water Works Association.

By those attending the Cleveland Convention of AWWA it may be recalled that Mr. Cole could not be present to receive the Honorary Membership bestowed upon him. In consequence the luncheon was arranged at a time when President Morris of AWWA was to be in New York and could make the presentation in person. Also attending the luncheon were a number of other officers in AWWA and several close friends of Mr. Cole.

The citration reads—

HONORARY MEMBERSHIP
TO
EDWARD SMITH COLE

President of the Pitometer Company of New York; a member of the Association since 1902; Chairman of the Water Consumption Committee, 1913-17; past-Chairman of the New York Section; whose development of methods for the measurement of water and the control of water waste are valuable contributions to the efficiency of water works operation.

Edward Smith Cole—M.E.

Following the presentation Mr. Cole was asked to give something of the history behind his conception of the "Pitometer" which has since proved to be such a valuable instrument. With characteristic modesty he obliged by revealing that the idea had come to him while a student at Cornell University in 1891, but that nothing was done with it until 1895 when he was in the employ of his father—a Chicago consulting hydraulic and civil engineer.

He felt it fortunate that he had for a boss a father who would listen to his ideas, which were developed during the years 1895-1896 on the Terre Haute survey. These two years of experimental development resulted in the "Pitometer" and the Cole methods for accurately determining inner pipe line flows with it.

NEW ENGLAND SEWAGE WKS. ASS'N. FALL MEETING

A Report by
GEORGE E. SYMONS
Associate Editor

MEETING in the historic Parker House in Boston, on Sept. 22nd, the NESWA under the presiding gavel of Prof. Roscoe Suttie, of Yale University, held symposia on Very Small Sewage Plants,

President

Roscoe H. Suttie
Prof. Civ. Engr.
Yale University

Guest Speaker

Vlado A. Getting
Health Commiss'n'r
Massachusetts

High Rate Trickling Filters, and Operators' Problems. In spite of an all day rain, 87 registered for the one-day meeting. The turnout of members spoke well for the officers of the section, and the drawing power of the program presented.

At the business session of the meeting E. Sherman Chase reported as chairman of the Post War Planning Committee. Mr. Chase outlined briefly the aims and program of the Committee for Water and Sewage Works Development of AWWA, FSWA, NEWWA, and WSWMA. It was decided that the NESWA and NEWWA have one joint committee to work under and with the National Committee.

As a member of the Operator's Award Committee, Stuart Coburn announced that the winners of the first annual operator's awards were all from Connecticut. First place went to Hartford, second place to Danbury and third place to New Britain. Mr. George Craemer (2nd V. P. of NESWA) received the award for Hartford, Walter Kunsch (now of Camp Endicott) for Danbury and John Szymanski for New Britain.

Very Small Sewage Disposal Plants

Under the leadership of Mr. Frank L. Flood, Chief, San. Engr. Section, Repairs and Utilities Branch, First Service Command, "Problems in the Design and Operation of Very Small Sewage Disposal Plants" were considered and discussed by Edward Wright, Assistant Engr., Mass. Dept. of Health; Warren J. Scott, Director, Bureau of Sanitary Engineering, Conn. State Dept. of Health, and Walter J. Shea, Chief, Bureau of Sanitary Engineering, Rhode Island State Dept. of Health.

Mr. Flood defined "very small sewage disposal plants" as those serving from one household to 1000

Award Winners

George Craemer
Hartford, Conn.

Walter Kunsch
Danbury, Conn.

persons, and said that such plants might be cesspools, septic tanks, tile drains, or subsurface filters. On these small systems good information is scattered through several different bulletins of State Boards of Health and Committee Reports of the U. S. Pub. Health Service.

One of the common methods of disposal in New England is the cesspool, consisting of a brick-walled well with no bottom. Such leaching cesspools should be at least 20 feet apart, and should be cleaned at intervals to prolong their useful life. Mr. Flood gave allowable rates for leaching as 5.3 gal. per sq. ft. per day if the fall of water is 1 inch per minute.

The most important criteria for septic tanks is that adequate capacity be available. The minimum capacity should be one day's flow for smaller installations. For flows of 4000 g.p.d. the capacity should be 10 hours plus 2½ cu. ft. per cap. sludge capacity. Sewage entering the tank should drop at least several inches to prevent scum formation at the inlet. All tanks should have openings for easy access, for cleaning at intervals.

Mr. Flood also discussed sand beds, subsurface filters, tile drains and the various elements of design in each. Pertinent comments included these: Tile should be laid above ground water level. Possible pollution of water supply should be avoided. Tile should be laid with at least a three-eighths inch space between ends, and flow should be controlled to the various fingers of the tile system. Trees and shrubs should not be planted above the tile area.

Mr. Wright, of Mass., spoke of cases of good design and bad operation and bad design and good operation. In either case the results are not satisfactory. Where the detention period of the tanks is at least 12 hours, reductions were obtained in B.O.D. of 31 per cent and in bacteria of 25 per cent. Where two-day detention was available the reduction was from 44 to 63 per cent for B.O.D. and approximately 75 per cent for bacteria.

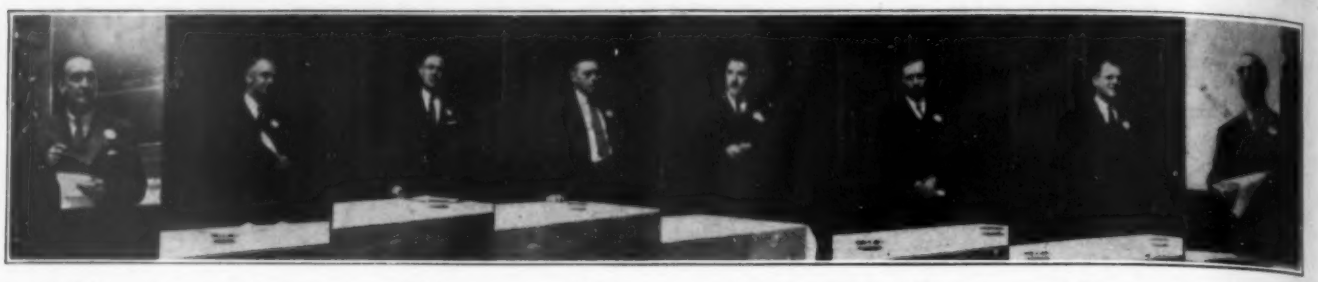
Mr. Scott of Connecticut made the statement that 99 per cent of all grease traps were no good and placed an increased load on the septic tanks. He also commented on the value of installations of twin septic tanks where possible.

Symposia Leaders

Frank L. Flood
Chief, San. Engr. Sect., 1st Service Command

Samuel Ellsworth
Cons. Engineer
Boston

Mr. Shea of Rhode Island pointed out that cesspools have some advantages and applications when properly installed but proper installation demands that the soil have sufficient leaching ability.



(1) (2) (3) (4) (5) (6) (7) (8)

Speakers' Table

(1) *Prof. Suttie, Yale University*
(2) *Frank L. Flood, 1st Service Command*
(3) *Edward Wright, Mass. Dept. of Health*
(4) *Warren T. Scott, Conn. Dept. of Health*
(5) *Walter J. Shea, R. I. Dept. of Health*
(6) *Walter Kunsch, Camp Endicott, Mass.*
(7) *John Szymanski, New Britain, Conn.*
(8) *Samuel M. Ellsworth, Boston*

Gas Burning Equipment

Speaking on the "Servicing of Sludge Gas Burning Equipment", Walter M. Kunsch, formerly Operator of the Danbury plant, now Supt. of Sewage Treatment, Camp Endicott, Rhode Island, outlined several important things to consider.

Bitumastic lined Cast Iron Pipe is satisfactory for gas lines. Gas lines should be flushed occasionally for cleaning, using a brush if necessary. Condensate traps should be installed at all low points in the gas lines. A sediment trap should be installed at the first low point in the line. Flame traps need inspection for moisture and scale. Pressure relief valves also need attention and cleaning at intervals.

Discussers

Maj. Rolf Eliassen
2nd Service Command
U. S. Engrs.
New York City

Maj. Guy E. Griffin
1st Service Command
U. S. Engrs.
Boston, Mass.

Condensate in the waste gas burner line should drain to the control building. The pilot line should be large enough to prevent clogging; use a 1½-inch line and reduce to ½ inch at the burner.

Wire for Vacuum Filters

John R. Szymanski, Supt. of the New Britain, Conn., Sewage Treatment Plant had made a survey of the "Type of Wire for Holding Vacuum Filter Cloths in Place" and reported that most of the plants replying to his questionnaire used iron or steel wire. Some preferred copper wire, not now easily obtainable, because it did not cause rusting of the cloth. Twelve or 14-gage wire is generally used. Wire from New Britain is used three times and then given to a neighbor plant for further use. Mr. Szymanski hopes that some research in the future will develop a method of holding cloths without the use of winding and the time needed to rewind a cloth. Some one suggested the string filter and this reporter told of the experience at the Westerly Plant in Cleveland where Saran plastic string is being used.

Paul Revere, a Pioneer in Public Health

At the luncheon when Dr. Vlado A. Getting, Health Commissioner of Commonwealth of Massachusetts, spoke on "Looking Ahead in Public Health Work," it was learned that Paul Revere was a member of the first Board of Public Health in this country. Dr. Getting pointed out that while typhoid fever is no longer a water borne disease, there is still ample room for improvement in public health by the protection of water supplies through proper treatment and disposal of sewage. As an emphasizing point Dr. Getting mentioned a city where the business district is ringed with cesspools and septic tanks. "There is no reason for cities not to have good sewer systems and disposal plants," said Dr. Getting, who expects further extension of sewage treatment facilities after the war.

Programmers

Charles H. Copley
Supt. Sewage Treat.
New Haven, Conn.

Joseph Doman
San. Engr.
Dept. P. W.
Greenwich, Conn.

High Rate Trickling Filters

Mr. Samuel Ellsworth, Cons. Engr. of Boston, acted as leader and introduced the symposium on the "Operation and Design of High Rate Trickling Filters." Informal discussions of the subject were given by Majors Guy E. Griffin and Rolf Eliassen of the United States Army, and Mr. John T. Norgaard of the Office of Chief Engineers, War Dept., Washington, D. C.

Mr. Ellsworth made comparisons of several characteristics of low and high rate filters, as follows:

Item	Low Rate	High Rate
No. of passes	One	Multiple
Dosage	Intermittent	Continuous
Min. Depth of Stone	5 ft.	3 ft.
Pop. Load/acre/day	2000-4000	30,000
Vol. load	2-3 mgad	15-30 mgad
Unloading	Periodic	Continuous

While high rate filters have many advantages, are economic of construction, and not subject to overloading, they do cost more to operate because of the pumping required for recirculation.

From a survey of the cost of construction of various filters, Mr. Ellsworth quoted some figures, indicating the bio-filter to cost from $9 to $11 per capita (average $10.50), whereas the low rate filters cost from $11 to $14 per capita (average $11.87). Pumping costs, of course, must be considered in studying the economics of the bio-filter.

Following these general comments, the speakers quoted some results and observations on various plants in their respective areas. Mr. Ellsworth, noting that at one plant,

where the load was .125 lbs. per capita per day of suspended solids, and .18 lbs. per capita per day for B.O.D. removals of suspended solids ran from 70 to 90 per cent, and of B.O.D. from 75 to 90 per cent.

Major Guy E. Griffin quoted observations showing the ability of high rate filters to take overloads and yet produce satisfactory results at such times.

Major Rolf Eliassen quoted data showing 80 to 90 per cent removal of the load, and commented on the ability of the high rate filter to recover from shock loads, stating that these filters would also handle industrial wastes, but pumping costs naturally increase.

Mr. John T. Norgaard commented on the increase in troop strength in camps caused by double bunking, and also on the increased concentration of camp sewage caused by the conservation of water. With these increased loads, according to Mr. Norgaard, it was shown that these high rate trickling filters could take loads far beyond the standard rate filter, and that these filters could be used as roughing filters ahead of low rate filters. Mr. Norgaard also stated that it had been shown that the standard rate filter could be converted to a partial high rate filter by the introduction of recirculation.

There having been some considerable discussion over the method of evaluating trickling filter operation whether in per cent removals, or in pounds per acre foot or per cubic yard, Mr. Norgaard gave the following figures to show the relation between the two units.

Loading—Lb. B.O.D.	Per Acre Foot		Per Cu. Yd.	
	Raw	Settled	Raw	Settled
Std. Filter	925	600	0.58	0.37
High Rate Filter	4620	3000	2.36	1.86

Through the courtesy of Mr. Norgaard, the model of a high rate trickling filter plant was on display. This model, shown in the accompanying photograph, was designed to exact scale by the Exhibit Section of the War Department at Howard University, Washington.

Booster Pumping Stations

In the Operators' Symposium (afternoon session), Charles H. Copley, Superintendent of Sewage Treatment, New Haven, Conn., opened the discussion on the maintenance of sewage booster pumping stations, commenting that pumping stations should be housed in good buildings, preferably of brick, with adequate ventilation and proper wiring, as well as foot valves that work.

Where heating units are not available, and the stations are damp in the winter, a bank of electric lamps may serve to eliminate the moisture condensation, and the corrosion which follows. Mr. Copley has found grease seals better than water seals on vertical pumps, but not so good on horizontal pumps, and he noted that lights should be kept on 110-volt circuit, and not tied in with the 220-power circuit. Chains or rods, for wet well level determination in connection with automatic starting and stopping, should be of non-corroding material.

During the discussion which followed, Stanley Kappe of Washington, D. C., suggested that when worn packing rings were replaced, all rings should be replaced, not just the top one or two.

Mr. Joseph Muldoon of Bridgeport, Conn., recommends ball bearing hangers for pump shafts.

Lime for Digesters

On the subject of lime suitable for use in separate sludge digesters and Imhoff tanks, Mr. Joseph Doman, Sanitary Engineer, Greenwich Department of Public Works, made comparisons between unslaked lime containing 95 per cent CaO and hydrated lime containing 73 per cent CaO, each with approximately one per cent of magnesium oxide. He also commented that plasterers finishing lime containing 50 per cent CaO and 33 per cent MgO is not satisfactory.

For small plants, Mr. Doman recommended the use of hydrated lime, as the trouble of slaking is not worth it. As to the method of controlling lime, Mr. Doman suggests that a pH of 6.8 to 6.9 is satisfactory for good digestion, but that lime should be added when the pH drops to 6.6.

Model High Rate Trickling Plant
(Displayed through the courtesy of the office of the Chief of Engineers, Washington, D. C.)

WATER AND SEWAGE PATENTS*

(Of Recent Issue)

Water Patents

CLARIFYING WATER. James M. Daley (to American Ozone Co.). U. S. 2,320,512, June 1. Removing suspended particles in liquids by ozonous and electrified air passed into liquid through porous plate, without agitation, but effecting coagulation and flocculation.

SUBMERSIBLE ELECTRICALLY DRIVEN PUMP. Lloyd Yost to A. O. Smith Co.). U. S. 2,320,708, June 1.

ROTARY PUMP. Herman Ray Ellingwood (to Adel Precision Products Corp.). U. S. 2,321,190, June 8.

WATER FILTER. Samuel Lieberman. U. S. 2,321,220, June 8. For attaching to a water faucet with set screws.

LIQUID FLOW CONTROL. Walter H. Green (to Infilco, Inc.). U. S. 22,335, reissue June 15. Flow through filter bed controlled by pressure differential sensitive member controlling power flow to valve on under drain system.

PROPORTIONAL CHEMICAL FEEDER. Chester T. McGill (to Elgin Softener Corp.). U. S. 2,323,-341, July 6. A proportioning apparatus to feed chemical solutions to a liquid in proportion to the flow of that liquid.

ANION EXCHANGE. Lothar Gerb, Berlin-Charlottenburg, Germany (to Permutit Co.). U. S. 2,-323,990, July 13. An anion exchange process carried on with the dissolved oxygen content reduced and held below 1 p.p.m. The exchange material contains basic hydroxyl groups.

ALKALINE WATER TREATMENT. Hilding B. Gustafson (to Infilco, Inc). U. S. 2,325,675, Aug. 3. A method for treating alkaline water with a hydrogen zeolite and subsequent coagulation.

WATER SOFTENING. Walter J. Hughes (to Infilco, Inc.). U. S. 2,325,679, Aug. 3. An equipment and process for flocculating and removing precipitated calcium carbonate, by upward passage of treated water through slurry of precipitated calcium carbonate.

CHLORINATOR. Joseph Garelick. U. S. 2,326,212, Aug. 10. Apparatus for feeding chlorine solution into a stream of water. Consists of an inverted bottle in a reservoir from which by siphon arrangement, the chlorine solution passes to a sealed transparent container, for observation, and thence to the water supply.

WATER SOFTENING. Raymond J. Kepfer (to E. I. du Pont de Nemours & Co.). U. S. 2,326,950, Aug. 17. Water softening process comprising addition of tetra sodium pyrophosphate to water followed by alkaline material selected from group consisting of sodium borate, sodium metasilicate and disodium hydrogen phosphate.

HARD WATER TREATMENT AGENT. Wilber O. Teeters (to E. I. du Pont de Nemours & Co.). U. S. 2,327,323, Aug. 17. A precipitate-inhibiting water-softening agent selected from the group consisting of pyrimidine, uracil, thymine, cytosine, purine, xanthine, guanine, and adenine.

FILTER BED CLEANER Charles Lose, Jr. U. S. 2,327,726, Aug. 24. A mechanical device for cleaning filter sand or granules beneath the surface of the bed. Machine moves back and forth lengthwise in the filter.

DEEPWELL PUMP. Thaddeus S. Harris. U. S. 2,327,637, Aug. 24. A double acting pump for deep wells.

VALVE CONTROL APPARATUS FOR ZEOLITE SOFTENER. Chester M. Irwin. U. S. 2,329,052, Sept. 7. Valve arrangement for controlling addition of regenerating solution to a base exchange water softener.

METHOD OF CONDITIONING WATER. Lewis O. Gunderson (to Dearborn Chemical Co.). U. S. 2,-328,551, Sept. 7. An organic surface-active boiler water compound.

WATER SOFTENING. Theodore Kaysen, Jr. (to the McKays Co.). U. S. 2,329,350, Sept. 14. A tank and system using a softening agent, with special connection and controls for regeneration by salt.

CHEMICAL CARRIER FOR WATER TREATMENT. Ashley L. Weaver. U. S. 2,329,429, Sept. 14. A reagent carrier adapted to to-and-fro movement in swimming pools.

WATER TREATING APPARATUS. Merrill P. Robinson (to Worthington Pump and Machinery Co.). U. S. 2,330,008, Sept. 21. A water softener tank for chemical softening with features for adding chemical to water and removing treated water.

HYPOCHLORITE DISPENSER. Walter S. Bachman. U. S. 2,330,328, Sept. 28. A four-armed cross member with vane to vary flow through the cross between inlet and outlet arms.

Sewage Patents

COMMINUTOR. August C. Durdin, Jr. U. S. 2,320,514, June 1. A comminutor of rotating and stationary discs for reducing solids, in a liquid, into small pieces.

ROTARY VACUUM FILTER. Arnold Mills and Herbert Rodgers. U. S. 2,321,230, June 8. Continuous rotary drum filter with filter compartment rotating through liquid and subjected to differential filtering pressure and blow back pressure.

SEWAGE TREATMENT. Frank N. Moerk and George M. Eisenberg (¼ to Edward P. Hyland and ¼ to A. M. Stackhouse). U. S. 2,326,303, Aug. 10. An aerobic process for treating sludge after sedimentation. Sludge is subjected to aeration by pumping from bottom of container to surface with tangential discharge. Sludge is kept in continuous suspension for 24 hours, with portions withdrawn to drying beds daily and replacement by fresh sludge.

SEWER SAND WASHER OR DESANDER. Hubert R. Crane and William D. Osborne. U. S. 2,328,060, Aug. 31. A mechanical device for cleaning sewers. Consists of a kite head with collapsible discal sections, a screw jack to facilitate retraction, and other members.

SEWAGE TREATMENT SYSTEM. William H. Lannert (to Chicago Pump Co.). U. S. 2,328,655, Sept. 7. An arrangement of a diffuser on a pipe which jacknives to raise the diffuser out of the tank.

SEPARATION OF SOLID SUBSTANCES FROM SUSPENSIONS. Frederick Juell (vested in Alien Property Custodian). U. S. 2,330,-589, Sept. 28. A method and device wherein gas is dissolved under pressure in a liquid containing suspended matter, followed by motion of liquid outwardly from center point with reduction of pressure to release minute bubbles which float suspended particles to surface of quiescent zone where solids and liquid are separated.

NEWWA ANNUAL MEETING AT BOSTON SEPTEMBER 28-29

By GEORGE E. SYMONS
Associate Editor

THE New England Water Works Association, too, has felt the pinch of war. Accustomed to an annual four day meeting, this year, the session filled but two days.

Presidents

(No. 1 Host)
Horace L. Clark, Supt. of Water, Sanford, Me. (President NEWWA)

(No. 1 Guest)
Sam B. Morris, Dean of Engineering Stanford Univ. (President AWWA)

Registration at the meeting was excellent, numbering 591, including the ladies, and there were several new applicants for membership. Reports of the Secretary and the Editor at the business meeting indicate a slight decrease in income and in the size of the Journal, while costs of publication have gone up. The budget committee reported that the association had gone in the hole some $900 on the year's budget, because of the war, but there still exists a very sizeable bank balance, well invested.

Committee Reports

Not all of the 26 committees reported, but the Committee on Committees recommended that the Water Works Education Committee be discontinued along with the Committee on Cooperation with the OCD, and at the same time suggested the formation of a Committee on Publicity, and another on Recruiting, Training, and Compensation of Water Works Operators. It was also recommended that the Joint Committees with AWWA be continued.

Reports were received from the Library Committee, the Committee on Cooperation with the Institute of Water Purification in England (a message was sent to England expressing pleasure that the Institute was again able to function in London). Chairman Samuel Ellsworth, of the Committee on the News Bulletin, made a short report, but suggested that the second issue of the Bulletin speak for the Committee. The Committee on Steel Pipe Specification reported that the AWWA had made some changes in the specifications, and recommended that the NEWWA adopt those changes. This was done.

Honored

Harry Edward Jordan (Sc.D.)
AWWA's Editor and Exec. Secretary, New York
(As the "Water Works Man of the Year," to him Honorary Membership for services extraordinary in the field of water supply.)

One of the most interesting committee reports was that by Mr. Arthur D. Weston, Chairman, who said, "The Committee on Water Works Co-operation in Defense was constituted largely for the purpose of the exchange of information between representatives of the several New England states, and for the purpose of suggesting new efforts which might be undertaken by the New England Water Works Association for mutual aid of communities and between states."

Vice-Presidents
(NEWWA)

Karl R. Kennison, Chief Engineer, Metro. Water Comm., Boston, Mass.

Harold W. Griswold, Deputy Chief Engr.-Mgr., Metro. Water Distr., Hartford, Conn.

In 1941, the setup of the Massachusetts State Emergency Plant had been outlined in detail, the activities of the Department of Health in Connecticut were described, and the activities of the Main Water Utilities Association, and the New Hampshire Water Works Association, were discussed. In 1942, the Committee reported the warnings of the U. S. Public Health Service, following the declaration of war, in the matter of protection of water works properties and treatment of water, and also dealt with the question of inventories, water works schools for the training of chemists and bacteriologists in methods of decontamination of water.

OWU's Gorman Speaking and Audience

Listeners at closer range—"Steve" Taylor (New Bedford, Mass.); "Don" Calderwood (Nashua, N. H.); Theo. Bristol (Ansonia, Conn.); Hugh B. McLean, Commissioner, and P. J. Lucey, Engineer (Holyoke, Mass.). Center picture is of Roger Eoty (Danvers, Mass.), and E. L. Filby, Field Director for the Comm. on Water and Sewage Works Development, discussing "Blue Print Now!" campaign plans. Next picture is "Art" Gorman reviewing accomplishments and future aims of W.P.B.'s Water Supply Division.

Committee Chairmen Report

(1) *E. Sherman Chase, (Post War Planning)*
(2) *Warren J. Scott, (Committee on Committees)*
(3) *Arthur C. King, (Legislative)*
(4) *Gordon Fair, Editor (Publications)*

Committee Report on Cooperation in Defense

The report for the past year discussed State Water Supply Coordinators, manuals, emergency organizations, water works schools, post war planning, water works employees, U-orders, excess inventories, copper tubing, rationing, and Federal agencies, as follows:

"In Connecticut a manual has been prepared entitled 'Manual on Emergency Water Supply and Sanitation Measures.'

"Some progress has been made in the organization of auxiliary groups to assist water works officials in time of emergency by enlisting the services of mechanics, plumbers, and others, although some resistance to this sort of program has been experienced with the water companies.

"Water works schools have been carried on in Main by Federal agencies, and in some of the other states, local officials have carried on schools for their auxiliary water works groups.

"Water works officials would do well to reduce to writing their plans for the post war period in order that funds may be utilized for this important sanitation need, and so that such works may be undertaken immediately when the opportunity presents itself.

"The water works industry, in common with other public utilities, has suffered a loss of personnel to the military services and war industry. Some water departments have been able to increase wages within Federal restrictions to permit them to bid against private industry to retain the services of water works employees desiring to leave for higher paid war industry positions. In general, municipal water departments have not been able to compete with industry.

"Two points of view have been presented with regard to the amount of assistance which should be rendered to local communities during this war period. One state has emphasized the need of maintaining adequate state agencies to aid local officials. Another state has emphasized the need of local officials trying to restrict their requests for assistance from state agencies which are already overloaded with work. Comment has been made as to the seeming inconsistency of placing trained personnel in service with Federal agencies, and returning them to the local areas to perform work similar to that performed while in civilian status.

"Excess inventories have largely been eliminated, but the water works officials have reasonable residual inventories in at least one of the states. At least four of the New England states have classified total inventories showing water works materials available for mutual aid.

"The War Production Board has frozen all utilities stocks of copper tubing, and controversy has arisen as to the price to be paid for this material. Water utilities had prudently stocked with copper tubing used for services in anticipation of shortage at the then market price, and it seems only reasonable that frozen stocks, if captured by government agencies, should be taken over at the price paid, unless it can be shown that some unfair practice has prevailed.

"The Committee is cognizant of the number of Federal agencies which have undertaken activities in the water works field, and of the overlapping of such activities to a considerable extent. While considerable progress in the coordination of these activities has been brought about, many local state officials are still at a loss to know how best to advise certain of the municipalities in these matters. If proper advice as to protection of public water supplies is to be given by the state authorities, then further clarification of Federal requirements must be forthcoming.

"In the matter of procurement of priority for water works materials, at least two Federal agencies are concerned. In certain instances, similar information has been furnished to representatives of these two agencies, in duplication of the effort required of the state in rendering assistance.

"It is the belief of the Committee that the water works officials in the several New England states have acted in close cooperation with Federal and state agencies. They must be forgiven if a certain amount of irritation has been apparent because of duplication of effort."

The membership of this Committee includes Theodore L. Cate (New Hampshire), Harry U. Fuller (Maine), Warren J. Scott (Connecticut), Joseph E. Moore (Vermont), Walter J. Shea (Rhode Island), and Arthur D. Weston, Chairman (Massachusetts).

Honorary Membership to Jordan; Dexter Brackett Medal to Ruggles

At the annual luncheon two items of business were consummated. Honorary membership in NEWWA was presented to Harry Jordan, Secretary of AWWA, by E. Sherman Chase, who extolled the long service of Mr. Jordan to AWWA, and particularly his work during the war years, work which had added much to his eminence as a water works

"Dan" M. Ryan, Superintendent of Water, Brockton, Mass., and Mrs. Ryan

"Ted." Wood, R. D. Wood Co., with Mrs. T. L. Halpin and "Tom" Halpin, A. P. Smith Mfg. Co., East Orange, N. J.

Lieut. H. L. Field, U.S.N., (Former Supt. of Water, Greenfield, Mass.) Mrs. Field and "Jo." L. Harper, Pittsb'g-Nat'l Meters, New York

Directors

Don. C. Calderwood, Chief Engineer, Pennichuck Water Co., Nashua, N. H.

Arthur C. King, Superintendent of Water Taunton, Mass.

man, one of the requirements for honorary membership.

At the luncheon, also, the annual presentation of the Dexter Brackett Memorial Medal was made to Arthur V. Ruggles, Assistant Hydraulic Engineer, Public Service Commission, State of New York, for his paper, "Determination by Statistical Methods of the Average Service Life of 6-in. Cast Iron Water Mains in Brooklyn, N. Y." The presentation was made by Prof. Gordon M. Fair, in the absence of Caleb Mills Saville, Chairman of the Dexter Brackett Committee.

Navy Advance Base Water Supplies

"Water Supply Equipment and Facilities for Advance Bases of the U. S. Navy" were described and shown (by slides) by Capt. Charles T. Dickeman, CEC, USN., Officer in Charge, Naval Advance Base Dept., Davisville, R. I., and Lt. (jg) D. H. Bennett, also of the Davisville Depot.

Advance bases may be large or small, permanent or temporary, and sized for PT boats or battleships. All require water supply facilities in accordance with the varied local problems and conditions. Capt. Dickeman described the Sea Bees, and told how they built these advance water supply facilities.

One of the ways of solving the problems is to standardize on equipment. For example, instead of several size motors being available to meet differing conditions and requirements for a power installation, several motors of the same size, 50 or 75 KW, are used. Saving space in shipping is another factor in the success of the Sea Bees, who often land with the Marines or right behind them. The Quonset Hut is an example of standardization of equipment that can be stowed in the smallest space on shipboard.

Lt. Bennett said that practically all supplies require treatment which may fall into one of three classes: Purification, to remove turbidity; hypochlorination, to insure removal of bacteria and other harmful organism; and distillation, when it is necessary to use salt water as the source of supply.

Slides were presented showing various types of units which carry out these three types of treatment. A standard pumping unit of 55 gpm

Dead

Frank P. Hall, Veteran Supt. of Water and Sewerage, Athol, Mass. (Died "with his boots on" while attending the convention—would have chosen it that way.)

generally is used. The purification unit consists of a pump, feeding devices for soda ash, and alum, a hypochlorinator with six months supply of "hypo." This compact unit, which is easily handled by two men, is followed by a pressure filter operated

Guest Speakers

Arthur E. Gorman, Director, Water Division War Utilities, Washington

E. L. Filby, Field Director, Comm. W. & S. Devel. AWWA. Hdqtrs., New York

at 15 psi. Backwashing is done when the pressure drops to 11 psi. Water is stored in elevated tanks made of canvas, or sometimes in wood stave tanks.

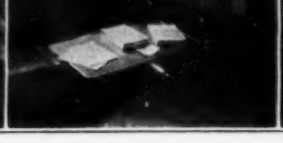
The hypochlorinator unit is small, capable of dosing with any required concentration, readily portable, and contains a six months supply of chemical. This unit is used only where no filtration is required.

Distillation is an expensive process, but may be performed in one of two types of stills, both of which have two stage distillation. These units, which produce about 26 gallons of water for each gallon of fuel, require both manpower and attention. The larger high pressure unit, mounted on skids, will produce 35 gal. per hour. When the stills are used to produce submarine battery water, the water must be stored in rubber lined tanks, handled with rubber hose, and pumped with lead lined pumps to prevent contamination. Pollution of distilled water by air-borne bacteria is a problem solved only by careful covering of the storage tanks.

Distribution systems may require from 5,000 to 125,000 gpd capacity. Units for advance bases are assembled complete for 250 men. For mobile bases, it is estimated that the capacity required will be 10 gcd, while for permanent bases, the ca-

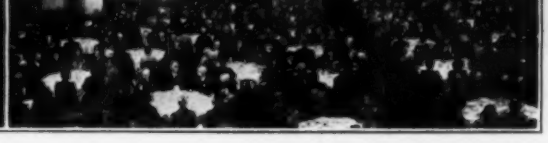
The Registration Line

Mr. and Mrs. Jack Diven, (Jackson Heights, L. I.), "Checking in," while California's Sam Morris pins his badge on



On Display

"Water Works and Sewerage's" New England Number



The Big Dinner

Following which there was a raucous "broncho-busting burlesque." Attendance 550— more or less

"Reggie" Hayes, Hydraulic Devel. Corp., Boston.

Mrs. Eban Lufkin, Eban Lufkin, New England Mgr., Pittsb'g-Nat'l Meters

Mrs. Jas. A. Sweeney, Manchester, N. H.

Mrs. Frank J. Gifford, Dedham, Mass.

Mrs. Percy A. Shaw, Manchester, N. H.

Mrs. Robert Manheim, Providence, R. I.

"Ed." Rothman, Wallace and Tiernan Co.

Mrs. A. L. DuBeau, Providence, R. I.

Mrs. Fred J. Reny,

Mrs. Milton Thorne,

Mrs. Harold Scales, (All of the Portland Water District, Portland, Me.)

Richard L. Sweeney, New England Manager, U. S. Pipe Co. Boston, and Mrs. Sweeney

pacity is estimated on the basis of 50 gcd.

Water supply is important, not only from the standpoint of maintaining health, but also as a morale builder. Cleanliness, made possible by good water supply, is important to the morale of the men. The importance of the water supply facilities is emphasized by the fact that the enemy frequently bombs such installations first.

Office of War Utilities Program

Arthur E. Gorman, Director, Water Division, Office of War Utilities, WPB, spoke on the "Program for Cooperation with the Water Industry." Mr. Gorman reviewed the developments of the past year, and pointed out that the risk of damage to water supply was no longer as great as it once was, and that cast iron pipe was no longer such a critical material. These are evidences of the tempo of the times. War production has changed from one of building plants to one of producing goods. This means that several changes in critical materials may be expected, but steel and copper are still unavailable.

In many areas the water problems are not yet solved. In others, phenomenal work has been done. This has been emphasized at Houston, where 35 miles of canals, and storage reservoirs, were constructed to obtain 50 mgd; at Hamilton, Ohio, where a well supply and 30 inch concrete pipe were installed to furnish water to an airplane factory at Lockland, twenty miles away; at Detroit, where within two months, a 160 mgd pumping station was installed to furnish water for war industries. Philadelphia loaned the pumps for this installation, Detroit and other communities cooperated.

Most significant development in WPB this year was the organization of the Office of War Utilities, under J. A. "Cap" Krug. This department has divisions devoted to power, natural and artificial gas, water and communications. The water division contains three sections; water supply, materials distribution, and service. Area Engineers have been appointed including R. D. Snow for New England.

The designation of OWU as a claimant agency to WPB has made possible the allotment of critical materials to the water utilities industry, with less confusion and more assurance of delivery, than under the old priorities system. There are two categories for materials for utilities: those used for maintenance, repairs, and operation, and those used for expansion. Operators have not been taking advantage of the U-1 order to obtain materials. Apparently they are not familiar with the more recent revisions in the order. Many do not seem to know that pipe size is not restricted, that inventories have been returned to the old P-46 base, and that $1,500 can be spent for minor underground extensions, or $500 above-ground, with no limitations on steel service pipe for 100 lb. pressure installations.

Conservation of water, along with other materials, light, gas, oil, coal, is part of a program of general conservation to overcome shortages in the fuels. All utilities should cooperate in the campaign to "Use Water Carefully", and should plan seasonal campaigns to prevent peak load demands during the summer particularly.

Mention was also made of the considerations given to possible drought. All utilities should know what they would need in the way of equipment in case of drought, and be prepared to tell the OWU, in order that the best utilization of supplies could be made should such a condition occur.

Mr. Gorman concluded with the statement that OWU did not want to pile paper work on the water works utilities. OWU has been organized to serve the water industry, and water works men should call on the Water Division for help in keep-

(1) *A. J. Roy, Dir. Pub. Wks., Lewiston, Me.*
(2) *Guy Classon, Supt. Water & Sewage, Leominster, Mass.*
(3) *G. G. Tardif, Supt. of Pumping, Lewiston, Me.*
(4) *Frank P. Morse, City Engr. & Supt., Salem, Mass.*
(5) *Jas. W. Reilly, Supt. of Water, Ware, Mass.*
(6) *E. J. Dionne, Water Register, Salem, Mass.*

Mathieson Alkalis' New England Staff.

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Jack Carey, Sales
"Bob" Mannheim, Mgr.
Archie DuBeau, Service
Providence, R. I.

(1) *E. E. Tankard, Supt. of Water, Berlin, N. H.*
(2) *Richd. Christiansen, Commissioner, Berlin, N. H.*
(3) *L. J. Hughes, Commissioner, Berlin, N. H.*
(4) *Leo F. Frechette, Commissioner, Berlin, N. H.*
(5) *Frank Wells, Johns-Manville, Boston.*

Mrs. Thos. L. Cate, Laconia, N. H. and Mrs. Roger Esty, Danvers, Mass.

Mrs. Karl R. Kennison, Boston, and Mrs. Geo. A. Sampson, Boston

Mrs. Paul Dudley, Mrs. Wm. P. Melley, Mrs. John Moore, Milton, Mass.

Mrs. Roger Oakman, Needham, Mass., and Mrs. "Al." Lash, Boston

Mrs. Sydney C. Beane, Weymouth, Mass., and Mrs. Russell L. MacDonald, Hollister, Mass.

ing equipment up to date, and in good operating repair.

Water Conservation

Mr. Lloyd Nelson, also of the Water Division, OWU, spoke on the background of reasons for the conservation program. Coal is a critical material. It will become more so because United States will have to furnish coal to Italy.

The public is being asked to stop waste, to conserve on coal heating, save on electricity, water, and gas. This program of voluntary conservation is planned for two phases; day-in, day-out saving, and seasonal elimination of peak loads. The water campaign has three parts; elimination of customer waste, elimination of industry waste, and improvement of water plant operation to eliminate waste.

AWWA is preparing a handbook on how to stop waste. This handbook will be mailed to all cities with a population of 10,000. Inasmuch as there were no funds for the publication of the manual, the recipient will be asked to send a check to cover the cost of preparation. All others desiring copies may obtain them by payment of the cost. Write to Harry Jordan, Secretary, AWWA, 500 Fifth Ave., New York 18, N. Y.

Mr. Nelson said the program did not ask the discontinuance of legitimate uses of water, but only the stoppage of waste. He suggested that the water utilities cooperate with other agencies in the municipality to carry out a program of education on this conservation matter. Mr. Nelson showed several posters and newspaper pictures designed to aid the campaign. Among them was the poster put out by the Industrial Chemical Sales Corp., saying "Don't Waste Water", and showing various ways and means of conserving water.

Questions and Answers

Both Mr. Gorman and Mr. Nelson answered questions at the end of the session. It was stated that a 2-in. steel pipe could be replaced with a 4 or 6-inch C.I. pipe, if needed, to the value of the replacement of the steel pipe, plus $1500 allowable for minor underground extensions. If conditions otherwise demand an increased pipe capacity, it is possible to obtain permission to make the installation. Copper may be used for goosenecks, not over 18 inches, provided the utility writes for permission to use them. Write to the Copper Division of WPB, Washington, Reference M9C4, state the case, particularly how many goosenecks will be needed in the next period. Permission is being granted for their use *from frozen excess inventory stock*, if the request is satisfactory.

A recent order of Sept. 21 has forbid manufacturers from making copper tubing for sale. The Copper Recovery Corporation will ascertain copper tubing can be sold from the utilities' frozen stocks, in place of that formerly being manufactured. Utilities will not be forced to give up copper tubing at scrap prices if the scheme works.

Mr. Gorman said that manpower was still the most critical material, and that the conservation program would materially help the manpower shortage. He asked that the water works men keep him informed of their needs, wants, and problems, in order that the Water Division can keep its finger on the pulse of the water industry.

[Because of wartime limitations on paper use, this report must be left unfinished. It will be completed in our November issue.—L.H.E.]

Philadelphia & Los Angeles Setting Up Sewer Rental Plans

At long last it appears as though the city of Philadelphia will be able to proceed with construction of sewage disposal facilities to be financed by sewer rental service charges. Balked twice by the Pennsylvania Supreme Court on financing plans based on sewer rentals, the city has recently introduced two ordinances which propose that sewer rentals will be based on water consumption and that these charges will be partially offset by a deduction from the water charges. The previous plans were based wholly or in part on assessed valuation of real estate and failed to meet legal conditions.

In the proposed scheme for charges, persons paying flat rate water charges will pay 115 per cent of the water bill as the sewer charge. Metered consumers will pay 105 per cent of the water bill as the sewer rental charge, if the connection is small. Large consumers will pay some fractional percentage of the water bill.

The City of Los Angeles has likewise recently proposed a sewer rental service charge of approximately $3.60 each year for each water service.

Wm. F. End, Vice-Pres., Ross Valve Co., Troy, N. Y.

Harry R. Prescott Pres., H. R. Prescott & Sons, Worcester, Mass.

George G. Bean, Supt., Exeter, N. H. Robt. C. Thompson, Supt., Rockville Water Co. Rockville, Conn.

Presidents Sam. Morris (AWWA), Stanford, Calif., and Horace Clark (NEWWA) Sanford, Me.

Jim McNulty, Chapman Valve Co., Indian Orchard, Mass.

Henry F. Hughes, Supt., Medford, Mass.

"Phil" Welch, Supt., Reading, Mass.

"Al." Casey, Supt., Stoneham, Mass. "Tom" Craven, Warren Pipe & Fdy. Co.

EXPERIENCES WITH WIRE WOUND PRESTRESSED CONCRETE PRESSURE PIPE*

Wherein Chicago Lays Two Miles of 36 in. Line to Furnish 10 mgd to New War Plant

By
W. W. De BERARD and W. B. WELDON
City Engineer and Assistant Engineer
DEPARTMENT OF PUBLIC WORKS
CHICAGO, ILL.

THE use of concrete water pipe in Chicago is a departure from the general practice as the entire distribution system of 3,851 miles of pipe is of cast iron with a few exceptions where a short section of steel pipe has been installed because of special conditions. But many new precedents are being established during these war times, and the use of concrete pipe in the Chicago system is one such.

During the summer of 1942, the Federal Government decided to locate a war production plant within

Fig. 1—Centrifugal Form Showing Prestressed Longitudinal Reinforcement.

the city at the southwest limits, and one of the important considerations in their decision was the readiness of the City to furnish an estimated 10 M.G.D. of water. In order to assure this supply it was found necessary to lay 11,244 feet of 36-inch feeder main, and as WPB regulations restricted the use of iron pipe it was compulsory that a substitute material be provided if possible.

*This paper, presented before the American Water Works Association, is printed by permission.

The Senior Author

In Chicago, all pipe is laid by the regular labor forces and the material is furnished by contract. The specifications for the pipe were drawn so that all types of pipe could be bid on, and the bidder was to furnish detailed plans and specifications of his particular type. The specification provided for an hydraulic yard test of 200 pounds per square inch; the pipe to withstand this test without cracking and with no harmful seepage. The specifications further provided for a field test of the pipe line under a pressure of 150 pounds per square inch, and the total leakage under this pressure was not to exceed 150 gallons per day per inch mile. The contractor for the pipe was to furnish a representative to supervise the making of the joints, and was accordingly held responsible for the tightness of the joints.

Prestressed Pipe Low

Bids were asked on a price per foot for 36-inch pipe on a basis of 11,244 lineal feet and a price each for special connection fittings as listed. The price bid was to include all sleeves, gaskets or other appurtenances necessary to install the pipe and fittings in the pipe line and also provided for delivery on the street along the proposed pipe line. The branch of the fittings must be equipped so that a connection could be made with Class "B" cast iron pipe. The 24-inch valves, to be set every half mile, were to be furnished by the City.

Bids were invited on three types of pipe; steel shell encased in concrete; reinforced concrete; and cement asbestos. Only one bid was received on the steel shell encased type at $10.25 per foot and one bid on the reinforced concrete type at $9.44 per foot. No bids were received on the cement asbestos type.

The low bidder was the Material Service Corporation bidding on the Lewistown Prestressed Concrete Pipe and Class "B" cast iron special fittings. This type of concrete pipe was to us comparatively a new type in the field of high pressure water pipe, but we had had some previous experience with it in connection with a 30-inch water line laid a year previous in a suburb. The engineers of the City of Chicago had been close observers of the performance of this pipe both in laying and under tests and as a result were favorably impressed with it.

A close study of the detailed drawings and specifications, together with correspondence with users of the pipe and visits to the plant, convinced the City's engineering staff that the pipe was well designed and would furnish a satisfactory pipe line under the specifications. Accordingly the contract was let to the low bidder on October 18th, 1942, and manufacture was started November 30th.

How the Pipe Is Produced

Spinning the Pipe

The pipe is molded in 12-foot lengths; that is, it makes up 12 feet

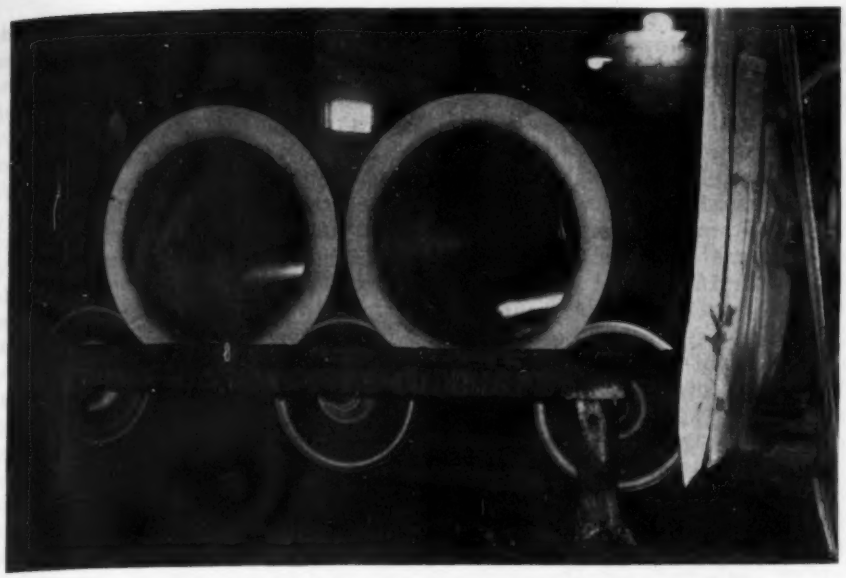


Fig. 2—Spinning Machine with 3-Inch Shell Complete in Form.

in the line. The inner shell of 3-inches of concrete is formed by the centrifugal process. Two pipes are made at the same time. Two steel forms are assembled. The form is a steel shell with one longitudinal joint which is bolted together. Cast steel rotating rings are fitted on each end and the inside of the rings are formed to shape the ends of the pipe with a taper. The form, shown in Fig. 1, is then coated with a rosin solution and the joints are taped to prevent leakage. Eighteen 5/16-inch steel longitudinal rods are inserted in the form one inch from the inside face of the form. These rods go through the flange-like end rings. Nuts on the threaded ends are pulled up by means of a strain wrench so that each rod is under a stress of 30,000 pounds per square inch. The forms are then placed on the rollers of the spinning machine, shown in Fig. 2.

Concrete is mixed in a batch mixer close by and is wheeled in concrete carts and dumped at each end of the forms on the concrete floor. The spinning is then started at 90 r.p.m. and one man at each end of each form shovels the concrete into the form. This concrete is sufficient to form one-half the total wall thickness. After it is placed the speed is increased to 250 r.p.m. and is spun for ten minutes. This spinning compacts the concrete and drives out the water which is carried on the inside surface until the spinning is stopped. The water runs out of the ends of the form and is broomed out until most of the water is removed. The floor is broomed up into a drain and another batch of concrete is dumped, the spinning at 90 r.p.m. is resumed and the balance of the wall thickness is formed. The spinning is then stepped up to 250 r.p.m. for twelve minutes during which each man slides a bar in and along the surface to true up the surface and remove the water. The machine is stopped, and the surface is examined for projections on the surface or for any foreign materials. The spinning is then resumed for another five minutes during which time a thin coating of mortar is troweled into the interior surface. The concrete is so hard and dry that no foot impressions are made. The purpose of spinning the wall in two operations is more certainly to remove the excess moisture and to prevent segregation of the materials in the concrete mix.

Removing Forms and Curing

The forms are then lifted by chain hoists, moved laterally, not on rails and rolled into a steam room for 24 hours of curing.

Before the pipe has cooled the forms are removed, the pipe meanwhile hanging on hooks on a chain hoist. In removing the forms the nuts on the longitudinal rods are first unscrewed and then the end rings are removed. When the nuts are released the 30,000 lbs. per square inch tension in the rods is taken up by the bond of concrete with a resulting compression in the concrete of 90 lbs. per square inch. This is the longitudinal pre-stressing in the concrete. The pipe is then carried laterally and placed on a pair of tracks over which it is rolled into another steam room and allowed to cure for at least two days. The cured pipes, ready for wrapping, are shown in Fig. 3.

Wire Wrapping

The pipe is then ready for wire wrapping and is placed in a wire stressing machine, shown in Fig. 4. Parallel to the pipe is an ingenious sand-ballasted dead weight wire feeding machine which travels parallel to the pipe under an automatic travel control. The wire is of spring steel, oil tempered, and has an ultimate tensile strength of from 210,000 to 225,000 lbs. per square inch. For this 36-in. pipe No. 6 wire was used and under our test requirement of 200 lbs. per square inch the wire was computed to be spaced on 0.51 inch centers as wound spirally. The pull on the wire, as wound, is 2600 lbs. and is secured by providing the acquired sand depth (load) in the wire feeding drum. This results in a compression stress of 1,500 lbs. per square inch in the concrete inner wall, which also contains the pre-stressed longitudinal bars. Therefore the concrete shell is

Fig. 3—Pipes Cured and Ready for Wrapping.

under compression longitudinally and radially.

Testing

The next step in the process is the hydraulic test. The specifications provided that one pipe out of each day's output of the spinning machine would be selected at random for testing under 200 lbs. pressure. In addition, the manufacturer chose to test every pipe under a pressure of 70 lbs. per square inch. Out of a total of 939 completed, 92 pipes have been tested under 200 lbs. pressure and not one pipe has shown any evidence of leakage within the joints or through the body of the pipe. Most of the tested pipes were only 3 days old when tested.

Protective Coating

After the testing, the pipes are rolled into the yard on blocking, and is operated as the concrete is deposited, releasing air pockets and water and producing a dense concrete wall.

The rack of 40 pipes is then enclosed within sectional wooden walls and covers. The whole group is steam cured for 16 hours, after which 20 pipes are removed and 20 new pipes are set and are subjected to another 16 hours of steam curing. In this way each pipe is cured for 2 days. One day in the form and one day with the form removed. When the form is removed pockets and voids, if found, are filled with neat cement mortar.

The steel sleeve being bonded on the pipe serves as a bell. The sleeve is 12 inches in width of ¼ inch metal with 1 inch flanges turned up on each end. On the inside of the sleeve 4 inches from each end been wire wrapped but not coated. It was then placed in the hydraulic testing apparatus and a Huggenberger strain gauge attached to the wire wrapping. The internal pressure was built up to 200 lbs. per sq. in., and the gauge indicated that the stress in the prestressed wire was increased by 6,000 lbs. per sq. in. This brought the total stress to 96,000 lbs. per sq. in. The ultimate strength of the wire is 210,000 lbs. per sq. in., and the yield point is 160,000 lbs. per sq. in. It was also found that the compression stress in the concrete was reduced from 1,500 lbs. per sq. in. to 300 lbs. per sq. in. Professor Crepps reported that a pressure of 230 lbs. would result in tension in the concrete. Raising the pressure to 275 lbs. per sq. in. would overstress the concrete in tension and would no doubt pro-

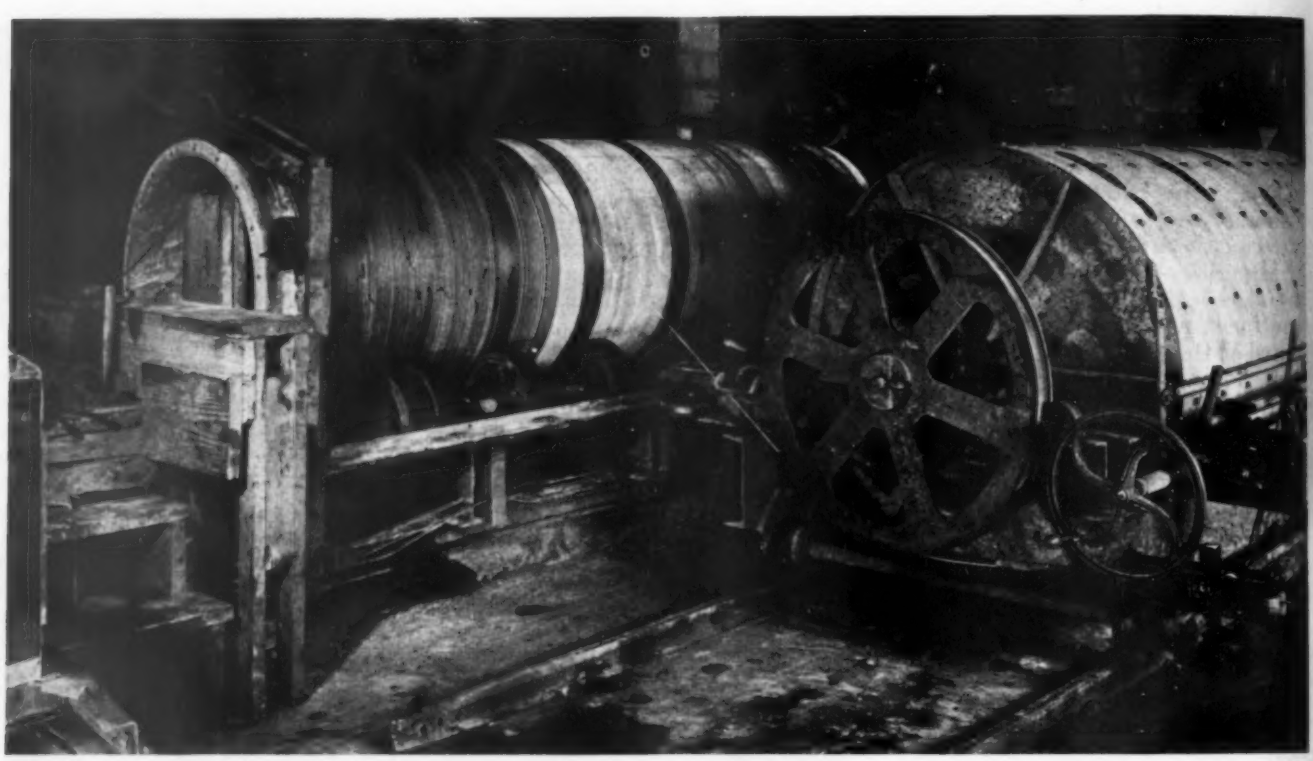


Fig. 4—Ingenious Wire Wrapping Machine Which Produces the Pre-determined Stress by Adjustment of Sand Ballast Load in the Wire Feeding Drum.

a steel sleeve with a rubber gasket inserted therein is pulled on one of the pipe ends, Figs. 5 and 6. A mesh reinforcement is set over the sleeve and extending 8 inches back over the pipe. The pipes are then lifted vertically with a crane and set with the sleeve-end down on a cast iron base ring. An outside form is set down over the pipe and the one inch outside wall of concrete is poured. This wall is merely for the protection of the steel wire against corrosion. Attached to the rib of the form is an electric vibrator which are welded two half round stopper rings to provide a stop for the rubber gaskets. The design of the sleeve is shown in Fig. 7, and the bell and spigot ends in Fig. 8.

As the pipes are removed from the pouring rack they are either loaded on trucks for delivery or are stored in the yard.

Experiments and Tests

Prof. Crepps of Purdue University Testing Laboratory made a strain test of a 36-inch pipe which was three days old. This pipe had duce cracks but that after the pressure was released the cracks would close up and heal.

Cutting-In a Connection

In Chicago it becomes necessary at times to provide a connection to a feeder main that was not foreseen as necessary at the time the main was laid. With our cast iron mains this is readily accomplished, without shutting down the main, by means of a sleeve type patent connection. It was not found that this had ever been done with a rein-

forced concrete pipe, so experiments were decided upon. The problem was to obtain a cutting tool that would cut a hole in the concrete and cut through the steel wire wrapping. After consulting machinists, tool makers, and welders it was decided to take one of our high carbon steel shell cutters and tip the teeth with stellite which was represented as one of the hardest metals and should do the job.

A 36-inch concrete pipe was set up near the testing apparatus and a 42x8 inch Mueller split sleeve connection was set on the pipe. The sleeve was run solid with lead and was caulked. The 8-inch valve was inserted in the opening in the sleeve and was run and caulked. An air-driven cutting machine was attached and the cutting was started. The cutter ran in about one inch when it was found that the feed shaft would not travel in without stalling. The cutter was removed and the teeth were found to have the cutting edges turned over. The wires had dulled the teeth without being cut. It was observed that the 1-inch pilot drill in the center of the cutter had cut through a wire and had advanced about 1 inch into the inner shell. It was decided to remove the cutter and use the pilot drill alone to cut through the wall and using this as a center to hand cut the hole from the inside of the pipe. When the wires were exposed they were cut with a torch and the 8-inch hole was complete.

Another purpose of the experiment was to determine whether the pipe would hold 200 lbs. pressure with 14 wires cut off. To make this test, shown in Fig. 9, the 8-inch valve was closed, bulkheads were placed on the ends of the pipe and eight 2-inch rods were used to hold the caps on. The pipe was filled with water and the pressure built up to 180 lbs. when the 8-inch "I" beams over the end started to deflect. The pressure was held at 180 lbs. Under this pressure there was a slight seepage at spots in the lead joint but no effects were noticeable in the pipe.

As far as the pipe is concerned the experiment demonstrated that the type of pipe offers no serious difficulty in providing an 8-inch connection but further efforts will be made to find a cutter that will cut the wires. Until such a cutter is found it is planned, if a connection is found necessary, to proceed as follows: Set the patent connection sleeve on the pipe and run the lead joint. Without setting the valve in the opening, hand cut the outer shell of concrete and expose the wires. Cut the wires with a torch and remove the pieces of wire. It is expected to do this with the City pressure on the main. The valve is then to be set in the opening, locked in the joint and run with lead. All the lead joints are then to be caulked. The cutting machine is then to be attached to the flange on this valve and the 3-inch inside wall of concrete is then to be cut out, the cutter is to be withdrawn and the valve closed. It is expected that the concrete disk will be withdrawn with the cutter. This operation is to be carried out as an experiment in the near future at the plant of the Lewistown Pipe Co. under about 70 lbs. pressure.

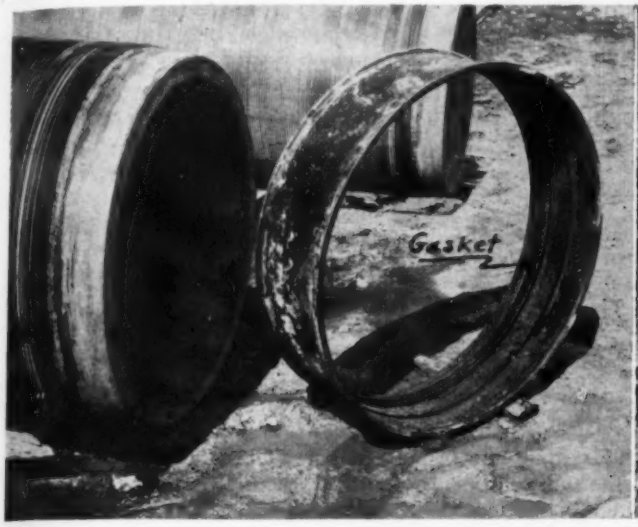
Inspection

The manufacture of the pipe was carried on only while an engineer of the City was present. This engineer was furnished a list of instructions as to the inspection to be exercised and he reported each day the various operations or steps completed each day on each pipe which was numbered inside and outside for identification.

Delivery and Laying of Pipe

The manufacture was started on Nov. 30, 1942, and the required number of pipes (950) was completed April 26. The average output of completed pipes was a little over eight per day through a severe winter. It was not thought advisable to deliver the pipes on the job site before the construction was to start as it was thought that possibly the spigot of the pipe might be damaged by children. However, our fears were groundless as no pipes were damaged after delivery. Delivery was started March 25 and completed May 27. When necessary the delivery was at the rate of 30 pipes per day.

The job site was 16 miles from the pipe making plant which was located at Hillside, Ill., 12 miles west of the City Hall. Delivery was made by two long flat body trucks each equipped with a power winch behind the cab. Each truck carried three pipes as a load, each pipe weighing 7,000 lbs. The unloading was done by hooking two 6x6 inch skids securely against the side of the truck. A snatch block was fastened to the other side of the truck opposite the middle of the pipe; a cable was run from the winch through the block and a few turns were taken on the pipe. The delivery side of the truck was jacked up with two two-inch pipes, and the



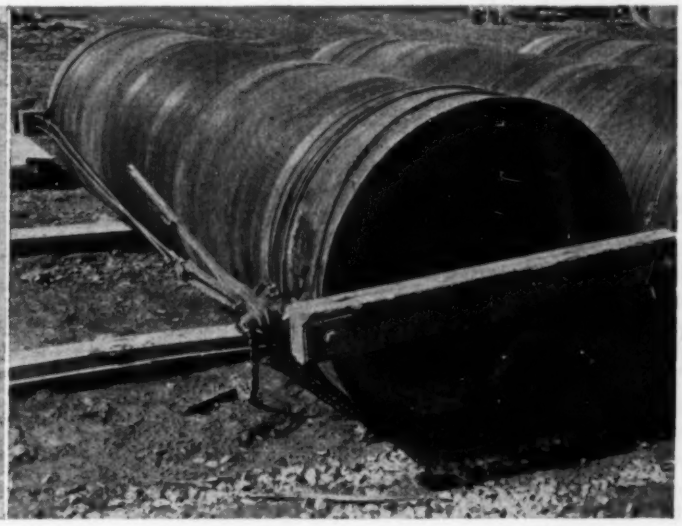


Fig. 5—Steel Sleeve Ready to Be Set to Form Bell End. **Fig. 6—Steel Sleeve Being Pulled onto Pipe by Chain Jacks.** (*Note Narrow Finned Rubber Gasket in Place—See Detail Joint Sketch.*)

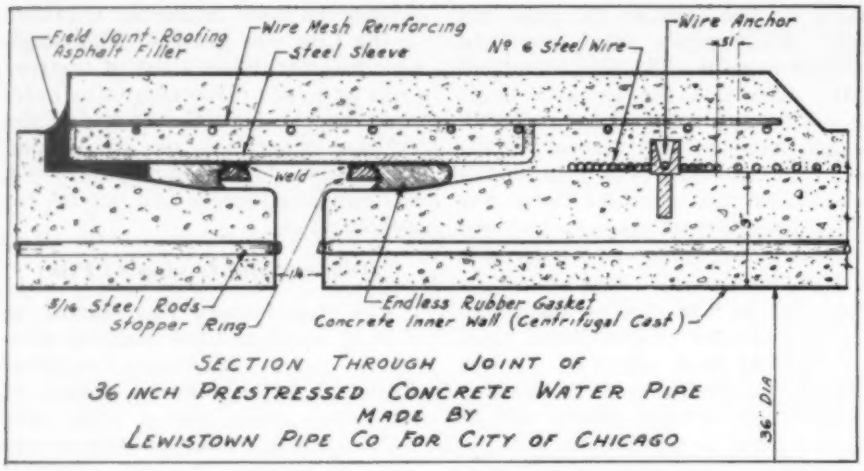


Fig. 7—Detailed Sketch of Joint Assembly of Two Pipes.

end of the cable was fastened to the far side of the truck. The pipe blocking was then removed and the pipe was pinched over to the edge of the body and through the brake control on the winch was rolled down the slide to the ground. This worked so satisfactorily that only two pipes were damaged in delivery.

Pipe Laying

The pipe was to be laid between the curb and the sidewalk on the east side of Rockwell Street to connect the 48-inch pipe in 50th Street to the 36-inch main in 67th Street. Work was started as soon as the frost was out of the ground, which was March 29. The equipment consisted of the following units: An Austin Trenching Machine, to cut the trench 5 ft. wide and 7 ft. deep; a gasoline tractor crane to handle the pipe; an air compressor with two concrete breakers to prepare street crossings and cross walks; a tractor crane for back-filling the truck; an automobile crane for filling utility trenches ahead of the trenching machine and loading surplus.

This being our first experience with this type of pipe a set of rules to be followed in laying the pipe were prepared and sent out to the foreman on the job.

Trench Preparation

The fronting property was completely built up with residences and two flats with some apartment buildings. The water service pipes were lowered below the trench depth in advance of the digging machine. The gas services were dug up in advance and were cut and equipped with a union by which a section of the pipe as wide as the trench was removed just in advance of the trencher. In general there were no obstructions to the digging machine. The soil was medium hard clay and the banks stood up fairly well, but the top 2 ft. was sloped and was cut into the excavation so that the digging buckets picked it up.

In the cross streets, at the ¼ mile points, were a water main, gas main, and telephone and power cables in conduits, all crossing the line of the trench. In most cases the water mains and gas mains were lowered or raised so as not to block the pipe. Where cables were found the trench was dug by hand under them and when the pipe was laid up to this hand trench the pipe was lowered by use of 1/16 bends to go under the conduits. The trench was also hand dug in advance under street car tracks. Notwithstanding these difficulties the average day's work was 277 ft. of pipe. The maximum day was 624 ft. laid.

The pipe laying forces have experienced no difficulty on account of the type of pipe and we are favorably impressed with the ease of handling and the making up of the joints.

Field Tests

After 4,000 ft. of pipe had been laid, the hydraulic test of the pipe line as provided in the specifications was attempted on the first valve section of 2,600 ft. The 24-inch valves were closed and braced with 6x6-inch timbers against the banks of the trench, and the valve north at 63rd St. was also backed up by about 60 ft. of cast iron pipe with lead joints. The pipe section was provided with 1-inch taps inserted in the sleeves at several high spots

Fig. 8—Sleeve (Bell) End and Spigot End of Pipe

to let out the air. A valve on a connection was opened to fill the pipe and after the air was all out the taps were closed and the City pressure of 37 lbs. was put on the section and allowed to stand for 24 hours. The connection valve was then closed and one of the taps was opened to test out the shutdown. No water was found leaking into the section and the tap was closed. Water through the connection valve was then by-passed through a one-inch meter and after the pressure of 37 lbs. was restored in the section the meter was rated. The flow was found to be 400 gpd, which is equal to 22 gpd per inch mile.

Valve Insufficiently Blocked

The testing truck pump was then used to pump up the pressure. There had been some doubt in the minds of the testing engineers whether the valve on the north end of the section was sufficiently blocked to withstand the pressure up to 150 lbs. without moving. Accordingly, a check mark was made on the pipe and a transit line fixed on the mark was observed while the pressure was being built up. When the pressure was up to 85 lbs. it was noticed that the pipe moved about ⅛ of an inch. It was also observed that the joint just north of the mark moved about ⅜ of an inch, which indicated that the valve moved ½ an inch.

The engineer decided that it was unsafe to apply any greater pressure under the conditions, the pump was shut down and the supply valve closed. The pressure on the main was observed for 35 min. during which time the pressure dropped to 55 lbs.

Subsequentiy, the pressure was reduced to City pressure of 37 lbs. and a meter rating was again taken for 20 min. No flow was indicated.

The pipe line was tight under 37 lbs. and the ultimate test was deferred until another section of pipe was completed when the City pressure could be exerted as a counter pressure and the blocking made more secure. It is to be noted that although one joint moved out an indicated ⅜ of an inch *no leakage occurred* at this joint which was exposed. There is evidence that the imposition of the 85 lbs. either forced out some air that was pocketed or tightened up a gasket or gaskets, by which the 400 gpd registered at this first test was eliminated. The gaskets have a feather edge which is exposed to the pressure and the pressure tends to force the gaskets against the pipe which would stop any slight leakage. Later on another section was completed and both were tested under 105 lbs. and found to be without leakage.

At the time of preparing this paper one-half mile of pipe remains to be laid. No section had been tested under 150 lbs. (according to the specifications) and the cost accounting was incomplete. It is now expected that the cost of the pipe laid will be $5.00 per foot less than 36-inch pipe has usually cost the City. The pipe is readily laid and when the spigot is entered into a bell the joint is made. The joint is flexible and is able to withstand reasonable movement, settlement or vibration without joint leakage.

As noted above pipe laying in Chicago is done by City forces of the Department of Public Works, of which O. E. Hewitt is Commissioner. Immediate construction was under M. E. Boylan, District Superintendent, and J. B. Eddy, Assistant Engineer, both reporting to B. W. Cullen, Superintendent of Water Pipe Extension. One of the authors (Weldon) prepared the specifications and had charge of inspection of the pipe plant.

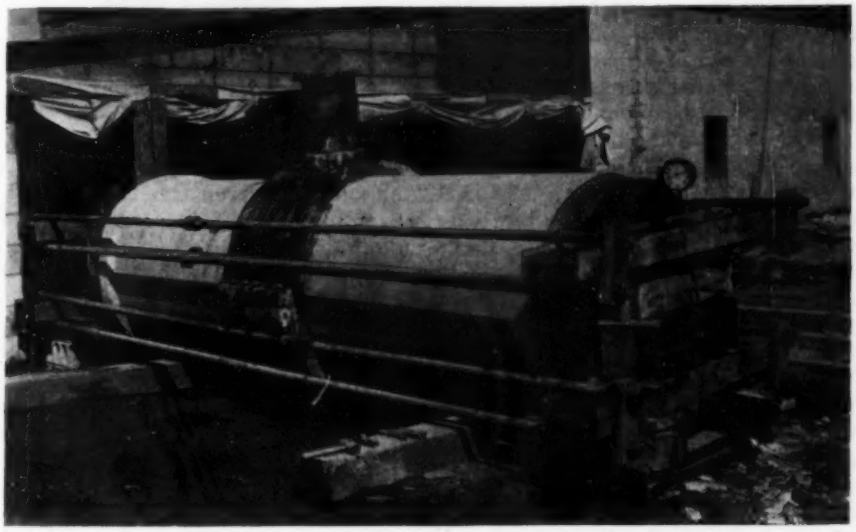


Fig. 9—Making an 8-Inch Tapping Cut on 36-Inch Concrete Pipe Under 180 Lb. Pressure.

Elected Officers by the Manufacturers Association

At a meeting held October 6th the Executive Committee of The Water Division of the Water and Sewage Works Mfg'rs. Assn. elected as its chairman, Chas G. Richardson of Builders Iron Foundry, Providence, R. I.

To chairmanship of the Executive Committee of its Sewage Division the manufacturers elected Linn H. Enslow, Editor of WATER WORKS AND SEWERAGE. Also Mr. Enslow was chosen as member of the Board of Control of the Sewage Works Federation to represent the Manufacturers Association on the Federation's governing body.

Mr. Richardson succeeds Fred E. Stuart of Stuart-Brumley Corp., as Water Division Chairman, and Mr. Enslow succeeds W. B. Marshall of Chain-Belt Co. as Sewage Division Chairman. Everett M. Jones, of Simplex, was elected vice-chairman by the Water Division and M. B. Tark of Link-Belt was chosen vice-chairman of the Sewage Division.

Linn H. Enslow

Chas. G. Richardson

At the Annual Meeting of the Manufacturers Association in Cleveland during the AWWA Convention Chas. A. McGinnis of Johns-Manville was elected president of Association, and Chas. A. Becker was elected vice-president.

DISPOSAL OF SLUDGE IN SMALL PLANTS*

By G. A. PARKES
Asst. City Engineer
PASADENA, CAL.

"THE production of sludge at a sewage treatment plant is unavoidable," according to a report in 1942 on the "Salvage of Sewage" by a committee of the Am. Soc. C. E. This sludge produced at any and every type of plant must be disposed of. Many other articles on the subject have appeared in various technical journals. Unfortunately most of these articles have referred to large plants and little information has been published regarding the operating experiences at small plants. This is largely due to the reluctance of operators in general to writing papers and submitting them for publication. In spite of the fact that many of the problems in small plant sludge disposal are left to the ingenuity of the operators they feel that they have nothing novel or spectacular to tell. It is the purpose of this paper to briefly present the case of the small plant.

Drying Methods

In almost all small and medium-sized plants in the West, sludge is digested in some type of digestion tanks. In most cases, digested sludge is periodically drawn to sludge beds. These beds are sometimes provided with underdrains but often, if natural sand or gravel deposits exist at the plant site, underdrains are omitted.

It is sad, but often true, that sludge beds are of insufficient area. Sludge beds, however, are usually one portion of a plant which the operator can enlarge, with or without additional help. Earth or sand banks are quite adequate but should be made wide enough so that access may be had to new beds. Ramps or driveways should be provided, in order that trucks can be backed onto the beds for direct loading.

Operating Hints

There is a tendency, when there is insufficient sludge bed area, to load the bed too heavily. This results in a thick heavy cake, which dries slowly, further aggravating the trouble. It is suggested that the sludge be drawn more frequently in thinner doses. A faster drying cake will result, and although the bed will require cleaning more frequently, it may dry a larger tonnage of sludge in a given time.

The Author

After the initial water has drained out of a bed full of sludge (usually within 48 hours), the remainder of the water is removed by evaporation, a slow process after the surface has dried. Consequently, cracking of the sludge is extremely important, so that the water inside of the cake may continue to evaporate through the greatly increased area exposed to the air.

Anything which increases the cracking will speed the rate of drying. A thin dose of sludge cracks more readily and for this reason dries more quickly. It is sometimes possible to hasten the final drying of a thick bed of sludge by turning over the partly dried cakes with a fork or heavy rake. The use of a cheap grade of commercial alum to increase the rate of drying has been reported from several eastern plants.

Digested sludge from which the gas has been allowed to escape before drawing to a sand bed dries with difficulty. Normally, well digested sludge contains a considerable portion of gas which is held in solution by the hydrostatic pressure in the bottom of the digester. When such a sludge is drawn, the pressure is released and the gas comes out of solution, causing the sludge to assume a foamy condition. This foam has a tendency to rise and permits the liquid to seep away into the sand, leaving the sludge in a porous condition which accelerates drying. If, however, the sludge has been exposed to the atmosphere, the gas will have been lost. De-gassed sludge, when drawn to a bed, will settle and seal the sand. The liquid can only be removed by evaporation and the sludge will dry slowly. If it is not possible to prevent the loss of gas, it may be possible to remove most of the ponded liquid from the surface of the bed by bailing or pumping from a small sump provided at one corner. The use of alum, already mentioned, appears to be a great help in handling de-gassed sludge, in that alum releases carbon dioxide gas from the sludge and restores the desirable foamy condition.

Sludge dries best during the warm, dry months of the year. Therefore a wise operator will program his sludge drying to take advantage of the good drying weather of the year, so as to go into the wet winter months with a minimum of sludge in his tanks.

Fly Trouble and Odors

A small fly, similar to the Psycho-da or filter fly, sometimes infests sludge beds, particularly when drying is slow. Fortunately, these flies do not migrate very far, except in a strong wind and then only in small numbers. Any measure which tends to hasten sludge drying will reduce the infestation and any insecticide, such as fly spray, insect spray, gasoline, chloride of lime, chlorine water or quicklime will assist in controlling these insects.

Well digested sludge, when first drawn, usually has a characteristic tarry or creosote odor which disappears within a few days. A foul smelling sludge indicates under-digestion. Dried digested sludge is practically odorless, except that, when used as a fertilizer on the ground and dampened, it will give off a slight odor. Raw sludge will produce bad odors unless dried quickly and should be promptly disposed of.

It is unwise for the operator to trust his own nose when it comes to odors. Anyone can become used to an odor, particularly if it happens to be connected with his means of livelihood, and what may seem to be a slight and unobjectionable odor to a plant operator, may be an exceedingly foul smell to somebody else. It is suggested that the operator should occasionally invite someone with a good active "smeller" to visit his plant.

While one or more of the measures outlined may assist in increasing the capacity of existing sludge drying beds, the only permanent

*Excerpts from a paper read before the California Sewage Works Association.

remedy for inadequate beds is to build more beds. It is recommended that the operator ask for outside help for the job. The operator should study the problem, lay out the work to be done, estimate the amount of labor required and submit the project to his superiors for action. In most cases, his forethought and planning will be appreciated and help will be provided for the job, particularly if he can show that no new materials will be required.

Emergency Methods

Some plants are so situated that the plant effluent is discharged into a large body of water. In such cases, it may be possible to discharge digested sludge into the outfall with the effluent. This should be done only when no other method of disposal is possible and then only at night, on an outgoing tide or under such conditions as will result in a minimum of nuisance. It should be remembered that the purpose of a sewage treatment plant is to remove polluting material from the sewage and after such material has been taken out, it should not be put back again.

Another method of sludge disposal is lagooning, used as a regular procedure in some plants. A sludge lagoon is simply a large basin or low area, with or without underdrains, into which sludge is discharged. Only in cases when there is an extensive area of low ground and there are no neighbors to complain of odors, is lagooning recommended as a permanent means of sludge disposal, although it is often the only method of disposing of excess sludge in an emergency.

Raw sludge, when exposed to the air in any case, will soon give off very foul odors unless heavily dosed with chloride of lime, chlorine, some other disinfectant or covered with earth promptly. Heavy applications of powdered gypsum have been used in some cases to control odors. Lagooning raw sludge is not recommended.

Dried sludge cannot be successfully burned in the open, even if gasoline or oil is used, as a smouldering, smoky fire usually results.

Final Disposal

Final disposal of sludge is accomplished only when entirely removed from the plant, in a manner sanitary, permanent and satisfactory to all parties concerned. There are several methods which may be considered as constituting final disposal.

Incineration is generally limited to large plants and usually preceded by mechanical drying. It is possible to burn air-dried sludge, as produced by a small plant, in a properly designed trash or garbage incinerator, if such were available, but the high ash content, about 50 per cent, might complicate the ash disposal problem.

Barging to sea is also a method limited to large plants situated on or near the ocean, as the high cost of sludge barges and equipment would be prohibitive for a small plant.

Filling of low ground with dry or partly dry sludge is practiced in many plants, but the method has limitations. The need for a considerable area of low but well drained land to prevent a bog formation; the need for an earth cover on the fill; settlement of the fill and so forth.

Fertilizer production is by far the most favorable method of sludge disposal. Digested sludge, in lump form or pulverized, has been used with success in all sorts of soils and crops, from orange groves to lawns and from sandy gravels to adobe. It may be used straight or mixed with other materials to produce fertilizers for specific purposes.

Digested sludge is not recommended for use on root type vegetables or low growing vegetables or fruits which are eaten raw. Raw sludge is, almost without exception, frowned upon as a fertilizer and heat-dried activated sludge, while an excellent fertilizer, is not now produced in the West.

Most of the plants in the West which have been operating for any length of time, have contracted with some fertilizer contractors for the sale of their sludge. The terms of these contracts vary widely but in most cases the contractor removes the sludge from the beds and pays a certain price per ton, per load, per year, or on some other unit.

While liberal "samples" of sludge may be distributed to interested parties, a charge should always be made for such material on a regular basis. People always have the idea that a thing is valueless if it has to be given away, just "to get rid of it." How much should be charged will depend upon local conditions and upon the degree of preparation of the sludge, but it will actually prove to be more satisfactory in the long run to use the sludge for filling low ground or to burn it up, than to depend upon persons coming to get it "free."

For retail sales, a pulverized sludge, sold in sacks, will find a more ready market. A light, farm type of mill may be used, if the sludge production is small, but a heavy duty machine is recommended for larger plants. The sludge must be well dried (preferably not over 10 per cent moisture before grinding in this type of mill) and will keep indefinitely in storage, if kept dry. The belt type of so-called sludge disintegrator or shredder is not recommended where a finely ground dry material is required.

It's "Prof." Bloodgood Now!

Word has just been received that Don E. Bloodgood, Superintendent of the Indianapolis, Ind., Sewage Treatment Works for the past fourteen years, has resigned to accept a position on the Civil Engineering Faculty of Purdue University at Lafayette, Ind. Professor Bloodgood ("Don" as he is better known amongst sewage works men) will teach sanitary engineering and do research and extension work.

We congratulate Don on his new association. We also congratulate Purdue University on obtaining the services of an engineer who is and has been an outstanding sewage plant operator. Students who sit at Bloodgood's feet will learn something more than theory. They will also learn operation, something that too many sanitary engineering students hear too little about during their student days.

Don E. Bloodgood

A winner of awards of the Central States Sewage Works Association, and an active participant in its affairs and administration, Mr. Bloodgood has always been a "sure bet" for participation in round table and floor discussions at meetings of both his Association and the Sewage Works Federation. It is pleasing to know that in his new work he will not be lost to these valuable meetings but will bring new and broader problems to light.

AN EASIER METHOD FOR DETERMINING SUSPENDED SOLIDS

By ALICE L. MATHIS
Chemist
PHOENIX ACTIVATED SLUDGE PLANT
PHOENIX, ARIZ.

THE title for this article was chosen with a two fold intention. First, that it is an accurate description of the method, and second, that the idea of an easier method will appeal to anyone who has to do the work.

The author makes no special claim for originality or brilliance in technique in employing this procedure, although so far as is known it was not in use in any other sewage treatment plant laboratory at the time it was started in Phoenix. Its use was inaugurated because of a strong objection on the part of the author to the Gooch crucible, especially in the determination of such small quantities of material, where the loss of even a shred of asbestos makes an appreciable difference in the final results. Weighed filter papers were first tried as a substitute for the Gooch crucibles. They are not entirely satisfactory, however, chiefly because of the difficulty of weighing them with sufficient accuracy, especially when the temperature and moisture content of the atmosphere vary.

The problem of a satisfactory substitute for the Gooch crucible was solved, at least to the author's satisfaction, when a centrifuge was obtained. The centrifuge was originally purchased to be used for some other work, but when the possibility of its use for determining suspended solids was realized, it was soon put to work in that capacity also. Seen in one of the accompanying photographs, it is an International Clinical Centrifuge with a four place head for 50 ml. tubes.

The Author

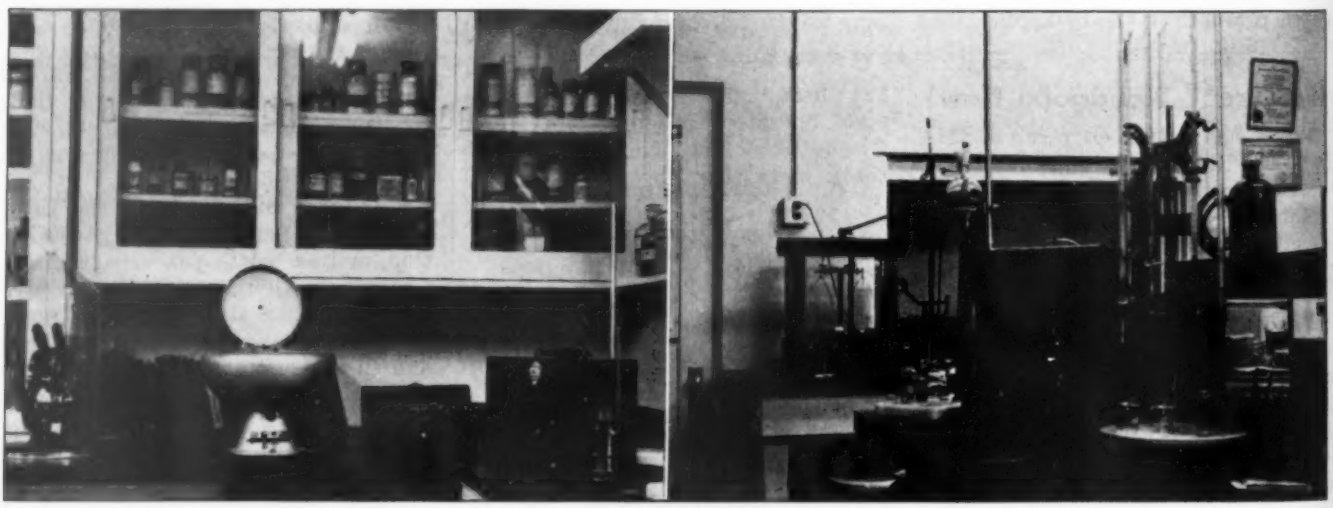
"If a reader's work is made easier the purpose will have been achieved."

Procedure

The procedure consists of measuring out a quantity of thoroughly mixed sewage into a 50 ml. centrifuge tube which has been washed, dried, cooled, and weighed. The sample is then centrifuged at top speed for 20 minutes. The supernatant liquid is decanted off and the residue in the tube is dried in the oven for 1 hour to constant weight, cooled in a desiccator for at least 2 hours, but not more than 5 hours, and weighed. The weight of the residue thus determined in milligrams, multiplied by twenty, equals ppm. suspended solids present in the sample.

Discussion

The length of time to centrifuge was determined by running tests on portions of the same sample for various time intervals. Intervals from 10 to 30 minutes showed little difference in the results, and it was decided that 15 minutes was enough for raw sewage and primary clarifier effluent samples. For samples of plant effluent it was found that 20 minutes was better, not that different amounts were thrown down but because the residue adhered to the tube better after 20 minutes' centrifuging. Twenty minutes was then chosen as a standard centrifuge time for all the samples. The intervals of time for drying and cooling were also determined by comparing results obtained under different conditions.



Two Views of the Well Equipped Laboratory of the Phoenix Plant.
Centrifuge Used in Routine Suspended Solids Determinations Appears in Left View.

TABLE I
Effect of Centrifuge Time on Results

Date	Time Interval	Sample	By Centrifuge Wt. 50 Ml. Residue—Mg.	Ppm.	By Gooch Ppm.
4-12-40	10 min.	raw	10.2 9.9	201	201
4-12-40	15 min.	raw	11.8 9.2	210	201
4-16-40	10 min.	raw	13.3 12.8 13.5 12.3	av. 260	267
4-23-40	15 min.	raw	11.4 11.9	233	250
4-23-40	15 min.	plant effl.	3.0 3.0	60	66

Results of several tests are shown in Table I.

Since constancy of results is of importance in tests of this type, it is interesting to see that very close checks on samples can be obtained, as shown in Table II, listing results on the plant effluent.

TABLE II
Duplicate Tests on Plant Effluent

Date	Centrifuge Time	Ppm.	Avg.
4-25-40	10	22	23
	10	24	
4-25-40	20	22	23
	20	24	
7-26-43	20	34	35
	20	36	
7-27-43	20	46	44
	20	44	
	20	42	

It has been observed that, in general, primary tank effluent and effluent samples from this activated sludge plant will check within 0.1-0.2 mg. in weight. Crude sewage samples, however, cannot be expected to check quite so well, since the suspended solids particles present therein are more diverse in size and weight. For this reason, and also to balance the centrifuge, the samples of raw sewage are run in duplicate, while centrifuging single portions suffice for primary clarifier effluent and plant effluent.

This method is now used at the Luke Field Treatment Plant, Luke Field, Arizona, where it was put into use as soon as a centrifuge was available. Table III shows the daily trend at the time the change from Gooch crucibles to centrifuge was made. These tests were made by Sgt. K. B. Jacobson, who learned the method in the Phoenix plant laboratory, and who is responsible for carrying out the laboratory work at the Luke Field plant. These figures were released through the courtesy of the U. S. Army Air Base at Luke Field.

TABLE III
Results of Suspended Solids Tests at Luke Field, Arizona

1942	Raw	Primary Effl.
Oct. 7	274	94
Oct. 9	292	92
Oct. 12	334	112
Oct. 14	278	84
Oct. 16	254	74
Oct. 21	250	86
Oct. 22*	294	104
Oct. 26	254	98
Oct. 28	284	80
Oct. 30	304	80
Nov. 2	286	86
Nov. 4	328	96
Nov. 6	292	108

*Centrifuge method started Oct. 22nd.

The chief objection which might be made to this method is that there is a possibility of retention of a little supernatant liquid in the tube which on drying leaves a deposit of dissolved solids, producing a higher result for suspended solids than is actual. That this is not a serious objection is shown in the results in Table II on plant effluent tests on July 26, 1943, in which the tube containing the second sample was wiped dry of any clinging drops of liquid before oven drying. If reasonable care is exercised to see that the liquid is poured off smoothly and quickly, there is little danger of losing any of the solids or of retaining sufficient of the liquid to create an error of consequence.

The centrifuge method is to be preferred because it is easier than the Gooch crucible method. The tubes are easier to prepare than the crucible with its asbestos mat, easier to use. There is no danger of losing any of the tube itself, again in contrast to the mat. The greater weight of the tube in relation to the surface makes them easier to weigh accurately than filter papers. The method yields consistent results, as shown by results in Table II.

If any reader of this paper finds that it makes his work easier or results more consistent, the purpose of its preparation will have been achieved.

Have a Heart!

A Plea for Common Sense

*By Bernard Rowntree**
Carmel, Calif.

We hear more and more about the use of non-critical materials. And probably there is more that we do not hear about just as we do not hear about the one-man sewage plant operator who is carrying on with whatever he can find or rescue from the local salvage pile.

But this plea is directed at the manufacturers, consulting engineers, and all others who make or buy equipment that some other person will have to lubricate, adjust, and maintain for many years to come.

In the same column on the same page of a recent trade journal are illustrations of two types of pumps. One shows a pump of the type we older men are more familiar with. On a substantial base or bedplate is mounted an electric motor and a pump connected by a flexible coupling. The bearings are accessible for lubrication and packing. The pump casing can be opened without disconnecting the piping.

The other illustration is of the modern variously known as "unit-built" or "close coupled" type with the pump casing being attached directly to one end of the motor. On the sales floor this one makes an appeal but after three years on the operating floor it may be a different story.

This is not a knock or a boost but an operator's plea for more common sense in the design and application of sewage plant equipment.

I will never forget the first automobile I bought that had balloon tires. The wheels were of the disc type but were dished the wrong way so that the valve stems were on the inside of the wheels. And the superintendent of our street department tells me it is more costly to repair modern equipment than the older models and that frequently it takes an hour to dismantle and an hour to reassemble some machines but only ten minutes to fix the part when it has been made accessible.

It would be well for manufacturers and consulting engineers to remember that human nature being what it is it is not reasonable to expect the normal operator to be as attentive to the hard-to-maintain machine as the one that it is a pleasure to work on.

And this is especially apparent in these times of manpower shortage and the necessity for making low paid jobs as attractive as possible.

For the small additional cost it would be wise to install machines slightly larger than the slide rule shows are necessary and all machinery should be stronger, more durable, and easier to maintain than is usually specified by the designing or consulting engineer.

*Manager of the Carmel Sanitary District, Carmel, Calif.

The Editor's Comments

All Sewage Plants Don't Smell

WHEN one can be led blindfolded into a screen and grit removal room of a sewage treatment works, and can't tell that he's at a sewage plant, then it's time to take some notice of the ventilating system and operating methods which make such an experience possible.

On a warm summer afternoon this writer had the impressive experience of visiting the joint sewage treatment plant of Minneapolis and St. Paul. He was escorted through the plant in the time honored and customary manner of "following the sewage through the plant." This of course means that the first point of visitation was the screen and grit building. It is frequently true, as has been often said—"A lay visitor to a sewage works can as a rule smell as much, or more, through his eyes than through his nose." However, also frequently the odor of stale sewage is considerably in evidence in the screen room. More than that, there is the pungent odor of sewer gases which flow into the building above the sewage. These pungent gases have the ear-marks (rather the "nose-marks") of benzene or gasoline residues after redistillation for recovery of the cleaning fluid by clothes cleaning establishments. They are eye smarting and irritating to the olfactory nerves. They give whatever otherwise mild sewage odor there might be mixed with them "fire-power" sufficient to cause the stomach of the uninitiated to make at least a flutter, if not a mild flip-flop.

On the above score this commentator has frequently made the remark that it would seemingly be better procedure to take first visitors to sewage plants to the effluent end of the plant *first* and work up-stream to the plant inlet. By this procedure the visitor would be more gently led to the most odorous part of the plant, rather than throwing on the load suddenly. By the "load" is meant both the eye *and* the nose smell load, which we of the profession do not begin to realize the potentialities of when hoping to make more effective "impressions" by first showing the layman the terrible looking raw material and then the attractive product which the process makes of it.

Well, let's now return to the screen and grit rooms of the Minneapolis-St. Paul treatment plant where we left off on the warm summer afternoon. Here the argument against taking the visitor into the screen and grit room first had no standing whatever. As previously remarked, it proved an impressive experience to be able to say that one would be truly drawing on his knowledge of the location, and his imagination, to say that he could smell either sewage or sewer gas in this screen building. To make the test in this case it would not have been necessary to make it blindfolded, because all that could be smelled through the eyes was effectively housed-in away from sight. In all it was an impressively neat room with power units, gages, switchboards and some enclosed mechanisms above floor, and the unsightly parts invisible.

So impressive was the absence of odors at this location, as well as at other points through the Minneapolis-St. Paul plant, it was appreciated that there was something especially worthy of note here in the direction of ventilation, design treatment—and, of course, operation. There followed the questioning of the plant boss, Chief Engineer and Sup't., George Schroepfer, who also had considerable of a hand in the design and construction of the Twin-Cities Plant, as to the why of such freedom of tell-tale screen room odors. The answers he was prevailed upon to repeat in the form of the article which is featured in this issue.

It is evident from results at the Minneapolis-St. Paul plant that a remarkable asset is an efficient forced ventilation system for a sewage plant. Added to this is the effectiveness of the housing-in design of unsightly and odor liberating units of the inlet works of sewage plants. In designing the sewage plant of tomorrow and improving the sewage plant of yesterday the design of the Minneapolis-St. Paul plant, and the use of facilities provided deserves study as a pattern.

Especial note should be taken of the gas-tight swinging "sewer damper" which seals off the sewer and prevents entry of pungent, nauseating (and ofttimes hazardous) sewer gases into the building.

The Wheels Are Rolling

In the matter of planning water and sewage works construction and betterments, as post-war projects, the wheels are already rolling.

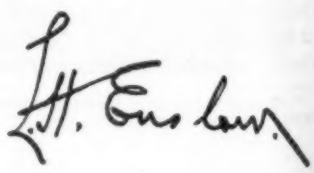
Attendance at meetings this fall has revealed a genuine interest in getting the water works and sewerage "house" in order for immediate betterments and new construction upon the cessation of hostilities.

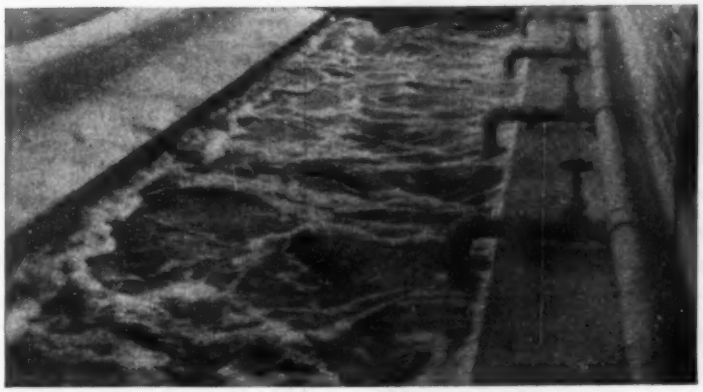
Perhaps the best evidence that the wheels are rolling in the direction of water and sewage works planning for the immediate post-war period is found in clippings from daily newspapers over the country. We learn for instance that consultants are at work on plans for a needed $3,000,000 sewage works expansion at Akron, Ohio, and that the people of Portland, Oregon, so far without sewage treatment of any sort, are to vote very shortly on a bond issue for a post-war treatment system. The argument advanced for raising the funds *now* for after war use is worthy of noting. The fact that a long term bond issue can be sold today at an extremely attractive low interest cost rate, whereas "tomorrow" it may well be a different story, is an impelling argument for raising funds in advance for advantageous post-war spending. And, all the way across country Portland, Maine, is showing signs of becoming sewage treatment minded.

Denver, Colo, is developing plans for enlarging and strengthening its water supply, which is to entail spending beyond the assumed ability of this community to invest in additional water supply facilities.

In a Tacoma, Oregon, paper a two column heading proclaims that "Tacoma Plans Huge Post War Betterments to Water System." The estimated cost of these improvements is $3,000,000 and plans are in readiness for bid taking and immediate post-war construction. The news item gives many of the improvements in detail. And, it also notes the advantageous situation of the present for selling local improvement bonds.

These are but a few of the news items from coast to coast which are indicative that unlike the situation which brought on the public works construction program of the depression period, money is cheap and readily available to municipalities; and, there is ample justification for water and sewage works betterments on a sound economy basis.





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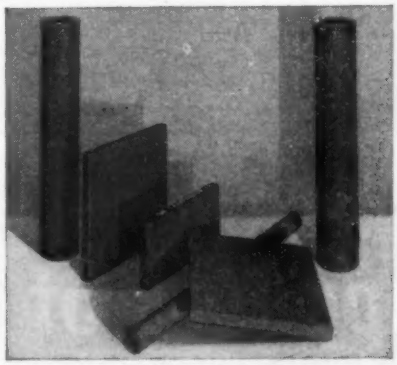

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MEETINGS SCHEDULED:

Oct. 19-21—MILWAUKEE, WISC. (Hotel Pfister).
Wisconsin Section A.W.W.A. Secretary, L. A. Smith, Superintendent Water Works, City Hall, Madison, Wis.

Oct. 21-23—CHICAGO, ILL. (Hotel Sherman).
Federation of Sewage Works Association. Annual Meeting, "War Time Conference." Secretary, H. W. Wisely, Urbana-Champaign Sanitary District, Urbana, Ill.

Oct. 21-23—CHICAGO, ILL. (Hotel Sherman).
Central States Sewage Works Ass'n. (Joint meeting with Federation Sewage Works Ass'n.) Sec'y-Treas., J. C. Mackin, Route 4, Madison, Wis.

Oct. 24-27—CHICAGO, ILL. (Hotel Sherman).
American Public Works Association. (Annual Meeting). Exec. Sec'y, Norman Hebden, 1313 E. 60th St., Chicago, Ill.

Oct. 25-26—JEFFERSON CITY, MO. (Governor Hotel).
Missouri Water and Sewerage Conference. Sec'y-Treas., W. A. Kramer, State Board of Health, Jefferson City, Mo.

Oct. 27-29—LOS ANGELES, CALIF. (Biltmore Hotel).
California Section, A.W.W.A. Secretary, H. Arthur Price, Box 3669, Terminal Annex, Los Angeles, Calif.

Oct. 28-29—NIAGARA FALLS, ONT. (Hotel General Brock).
Canadian Inst. of Sewage & Sanitation. Annual Convention. Secy.-Treas., A. E. Berry, Dept. of Health, Parliament Bldg., Toronto, Ont.

Nov. 1-2—PITTSBURGH, PA. (Wm. Penn Hotel).
4th Annual Water Conference. Chairman, H. M. Olson, The Engineers' Soc. of Western Pa., Hotel Wm. Penn, Pittsburgh, Pa.

Nov. 1-3—WINSTON SALEM, N. C. (Robert E. Lee Hotel).
North Carolina Section A.W.W.A. and North Carolina Sewage Works Association. Sec'y-Treas., R. S. Phillips, Box 1170, Durham, N. C.

Nov. 3-4—SPRINGFIELD, ILL. (Leland Hotel).
Illinois Water Plant Operators Conference. Secretary, Paul Harris, Superintendent, Herrin, Ill.

Nov. 4-5—CLARKSBURG, W. VA. (Hotel Stonewall Jackson).
West Virginia Section A.W.W.A. and West Virginia Conference on Water Purification. Secretary-Director, J. B. Harrington, Dept. of Health, Charleston, W. Va.

Nov. 4-6—ATLANTIC CITY, N. J. (Hotel Madison).
New Jersey Section A.W.W.A. Secretary, C. B. Tygert, Box 178, Newark, N. J.

Nov. 9—CONCORD, N. H.
New Hampshire Water Works Association. Secretary, C. E. Ferry, Manchester, N. H.

Nov. 18-20—FORT LAUDERDALE, FLA. (Governor's Club Hotel).
Florida Section A.W.W.A. Secretary, A. P. Black, University of Florida, Gainesville, Fla.

Nov. 22-23—ROANOKE, VA. (Hotel Roanoke).
Virginia Section A.W.W.A. Secretary, F. H. Miller, 119 State Office Bldg., Richmond, Va.

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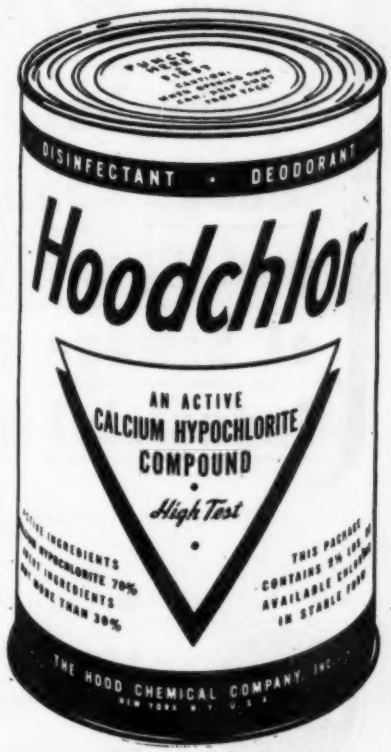

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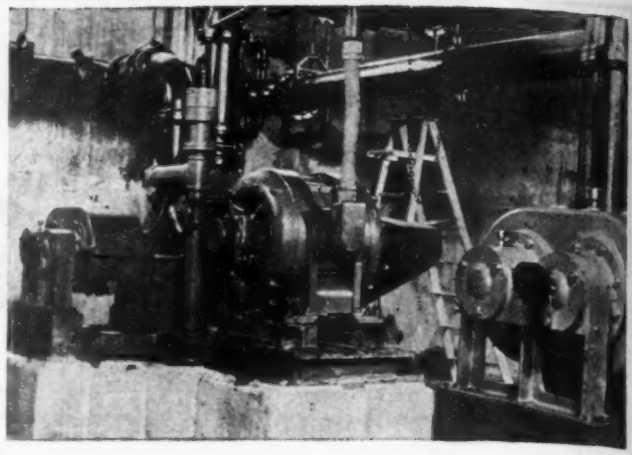

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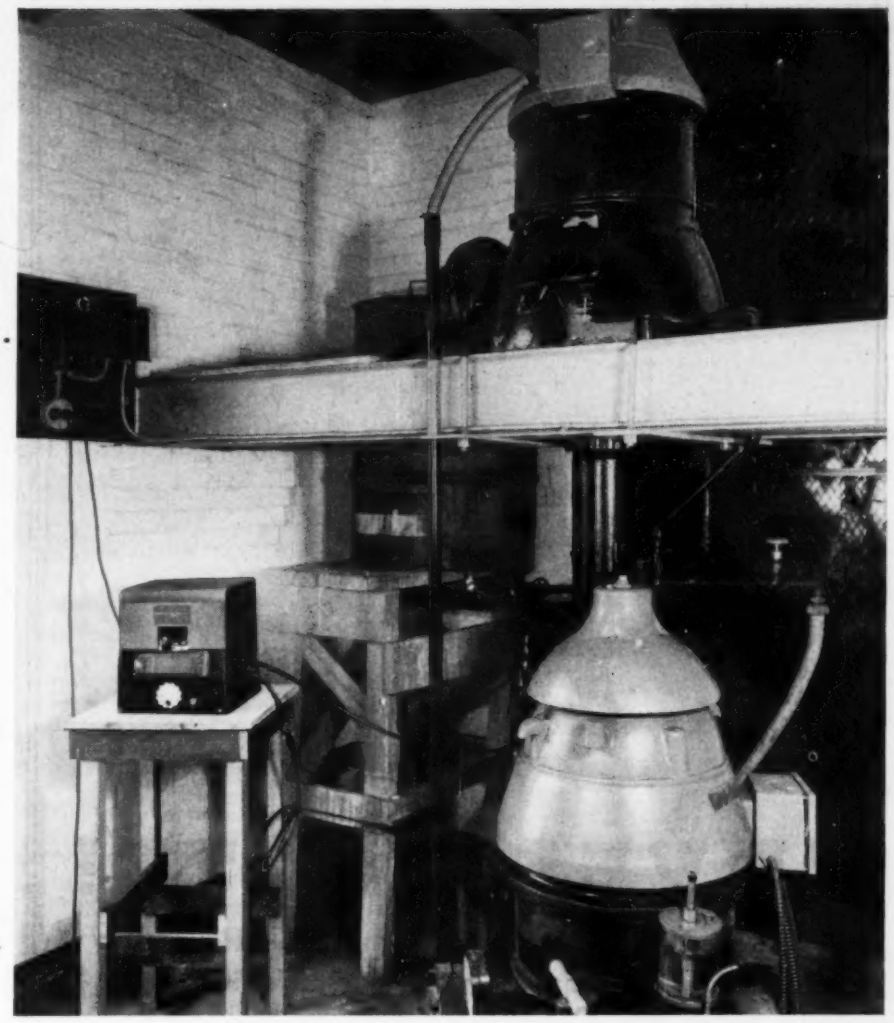
*Here and There with "Doc" Symons**

"Doc."

ONE cannot escape the fact that Sanitary Engineering is going to play a big role in the post-war world. Here in this country the slogan, "Blueprint Now!" is pointing the way for much future development in this field.—In Central and South America, the health centers which have been formed as an aid to the war effort are expected to lead to expansion of sanitary facilities and ideas.—Only recently, Marcello Biandao, of the Federal Service Water and Sewage of Rio de Janeiro dropped into our office for a chat.—On a dining car between Boston and Albany, we heard a man telling of the Chinese government sending students to this country to study civil and sanitary engineering.—In Chicago at the Sewage Works Federation Meeting, Ed. Cleary of *Engineering News Record* is going to speak on sanitary engineering conditions and prospects in South America, as he saw them on a 16,000 mile trip.—While all this interest looks like an expansive future in sanitary engineering, American Consulting Engineers should be warned that practice in most of those countries is restricted to Nationals, and large scale building of sanitary facilities must await a relatively long period of education of the people and an elevation of the standard of living to a point where such facilities can be appreciated and—paid for.

* * *

News Notes:—Anselmo F. "So" Dappert, (N. Y. State Dept. of Health) and chalk talk artist extraordinary, is now at the University of Virginia attending the school for Military Governors. A Major, no less. . . . A. S. Behrman, formerly of the International Filter Co. and now Lt. Col. in the Sanitary Corps, is back from somewhere in the Pacific. He is now attached to the "Paragraph Troops" in Washing-



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The constant rate, electric driven Var-I-Feeder shown above, is cross connected on the starting switch of a one million gallon per day water pump. Potassium permanganate (a most hard-to-handle chemical) and Calgon solution is drawn from the reagent tank shown behind the pump. The elevated tank is for mixing the two chemicals into one solution and for settling out before use.

Var-I-Feeder injects 2 gallons of this solution hourly into the 70 ft. level of well casing below ground.

The permanganate feed prevents crenothrix formation, an iron forming bacteria that must be killed before water is fit for brewery use. Calgon controls corrosion.

The Var-I-Feeder suction and discharge tubings are of flexible plastic.

Note the small size of this chemical feeder in proportion to the plant it serves.

Another feature of the new Var-I-Feeder is the controlling of feed by adjusting speed. This is done by simply turning the handwheel on the front of the machine until the needle on the illuminated scale points to the desired rate of feed. The Var-I-Feeder is made in both stationary and portable models—with the portable model having a total weight of only 57 lbs.

The Var-I-Feeder is manufactured by Chem-Feeds, Inc,, 77 Reservoir Avenue, Providence, R. I.

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- **No motor, stuffing box, packing or high speed moving parts**
- **Valves and diaphragm resistant to corrosion and abrasion**

These six features of the O-D-S (the Oliver Diaphragm Slurry) Pump just about tell the story of why this pump is a hit throughout the process industries. Simple—efficient—reliable; and because of its flexibility it is frequently used for metering and proportioning solutions.

Several sizes available. Write for our Bulletin 307-R, which gives further details and tell us about your pumping problem.

OLIVER UNITED FILTERS INC.

New York 18, N. Y.
33 West 42nd Street

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Chicago 1, Ill.
221 N. La Salle Street

Western Sales Division
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2900 Glascock Street

Factories: Oakland, Calif.—Hazleton, Pa.—Orilla, Ont., Canada—Melbourne, Australia

10-OUF-6

ton. . . . Mark Owen, formerly of Nichols Engineering Research and one time Com. of Public Works of Dearborn, Mich., as well as expert on sludge disposal dropped in one day at the office, and said he was one of the "Availables" now. . . . Larry Luther, the big boy from Long Island, is back in the States on furlough from a Red Cross Field Director's job. . . . The slogan "Blueprint Now" is beginning to catch on. A recent news item says Havens and Emerson are surveying the Akron disposal plant preparatory to postwar reconstruction and additions. Sizable amount, too.

* * *

You don't have to be so smart to run a sewage plant according to Major Rolf Eliassen, who told this one at the NESWA meeting in Boston. Rolf had once inspected a sewage plant at a California institution, located some distance away from any city. Rolf asked if the operator drove back and forth from the city to work. The operator said, "No, I live in that row of buildings up on the hill." "Well," said Eliassen ,"it certainly is nice of the State to provide the sewage operators with barracks." To which the operator replied, "Barracks, Hell, I'm nuts!"

* * *

Most of the persons attending the N. Y. Section Meeting at Binghamton appreciated the proximity of hotel to railroad from the graphic description voiced by Jim Walker of J-M's Transite Division, when he said, "Every time a train came by I had to step out of my room to let the train through."

* * *

Imagine that! There's a price ceiling on sewage sludge now. By an order issued on Sept. 17th, the OPA set a ceiling price on fertilizer from sewage sludge, specifically naming the cities of Houston, Chicago, and Milwaukee as producers. Order MPR-470 according to our correspondent.

* * *

At Binghamton, too, after hearing Francis Hallinan's description of the ortho-tolidine test for "active" chlorine, Mr. Jackson of Waterford wanted to know how come he could carry a residual of five p.p.m. without any taste. He also made other impossible statements about how when he added 16 p.p.m. of chlorine it disappeared in 30 hours. Forty p.p.m. dwindled to 0.7 and 100 to 10. "What is the Chlorine Demand?" he asked. There is a swell spot for some reseach on break-point chlorination.

New low-cost method puts it in reach of every community

EVERY home in your city—every shop, every factory—can enjoy soft, sparkling water at the turn of a tap. Recent developments by Permutit* make it more practical than ever.

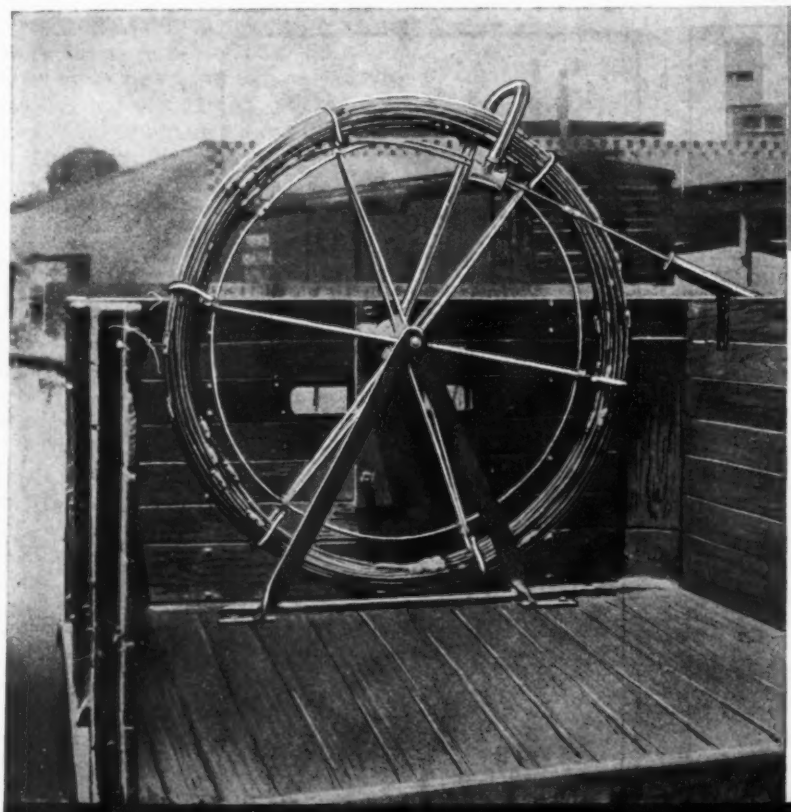
Your city may best be served by a zeolite water softening plant, a Spaulding Precipitator for cold lime softening or by the new cold lime method—the "Spiractor", Permutit equipment for these processes is modern and economical.

Better water will contribute heavily to the happiness and prosperity of post-war cities. Plan it now for *your* community. Write for details to The Permutit Company, Dept. G1, 330 West 42nd St., New York 18, N. Y. In Canada: Permutit Co. of Canada, Ltd., Montreal.

Trademark Reg. U. S. Pat. Off.

PERMUTIT

WATER CONDITIONING HEADQUARTERS



HERE'S ANOTHER CONVENIENT WAY TO MOUNT YOUR FLEXIBLE "EZY" ROD REEL

FLEXIBLE'S new, EZY Rod Reel eliminates the need for hooking and unhooking rods when winding or unwinding.

Many sewer departments are mounting the reel on the side, back, or inside of their service trucks or trailers to have them ready for use at all times.

This is only one example of the many time and money saving features of the FLEXIBLE line of sewer cleaning tools.

FLEXIBLE SEWER-ROD EQUIPMENT CO.

9059 VENICE BOULEVARD LOS ANGELES, CALIFORNIA
401 BROADWAY, NEW YORK, N. Y. • PICKWICK BLDG., KANSAS CITY, MO.

QUICK - ECONOMICAL - EFFECTIVE

Wartime emergencies may bring you face to face with a serious repair problem—without notice or warning. If this occurs, a supply of these Doublex Simplex Split Sleeves may be "worth their weight in gold." They permit quick, economical, effective repair of broken pipe. You should have in stock several of each size that you might need. They have been on the market for 14 years and many thousands of them are now in use.

AMERICAN CAST IRON PIPE COMPANY

BIRMINGHAM 2, ALABAMA

Dallas Houston El Paso Pittsburgh Kansas City Chicago Minneapolis New York City Cleveland Los Angeles San Francisco

Pumps for MODERN INDUSTRY

Type AD Hor. Split Case Two Stage Centrifugal

Type GMC Close-Coupled Centrifugal

Type OD Hor. Split Case, Double Suction Single Stage Centrifugal

AURORA CENTRIFUGAL PUMPS for WATER SUPPLY • CIRCULATING • CHEMICAL HANDLING • TRANSFER • CONDENSATION • SEWAGE • CONSTRUCTION • MARINE • DEEP WELL • IRRIGATION • WASHING • COOLING • HOUSE and many other SERVICES IN INDUSTRY.

A distinguished line embodying the latest hydraulic practices—a type and size for every need.

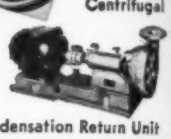
NSA Aurora Centrifugal Sump Pump

APCO Single Stage Turbine-Type

Write for CONDENSED CATALOG M

Type GGU Side Suction Single Stage Centrifugal

APCO TURBINE-TYPE PUMPS—the simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.



APCO Horiz. Condensation Return Unit

DISTRIBUTORS IN PRINCIPAL CITIES

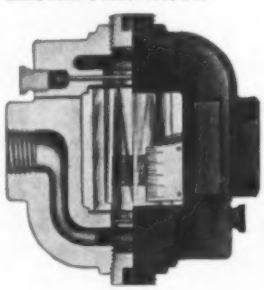
AURORA Always PUMPS

AURORA PUMP COMPANY

68 Loucks Street, AURORA, ILLINOIS

Flow Indicator...
new... inexpensive

The float in the new F&P Rota-Sight gives a continuous indication of the true flow rate of gas or liquid passing through it. A novel fluted metering tube gives wide flow range in a short scale length. Sturdy... compact... universal connections... cast in all metals... ¼" to 6". Available also with alarm attachment. Send for Bulletin 92-A. Fischer & Porter Company, 5411 County Line Road, Hatboro, Pa.



SterFlators by Everson

Astonishingly
Accurate in metering chlorine.

Astonishing
Capacity range—ratios up to 1 to 110.

Astonishingly
Easy to operate.

Safe
Protected by automatic shut-off, vents and siphon breaks.

Write
for Bulletin.

EVERSON MANUFACTURING CO.

233 W. Huron Street **Chicago, Ill.**

At the Ohio Sewage Conference last June, we learned that there is a difference between "suds" and "foam" in activated sludge plants. When "suds" are present it probably indicates a lack of sufficient dissolved oxygen. When "foam" or large bubbles occur, the process is operating correctly, according to an expert.

* * *

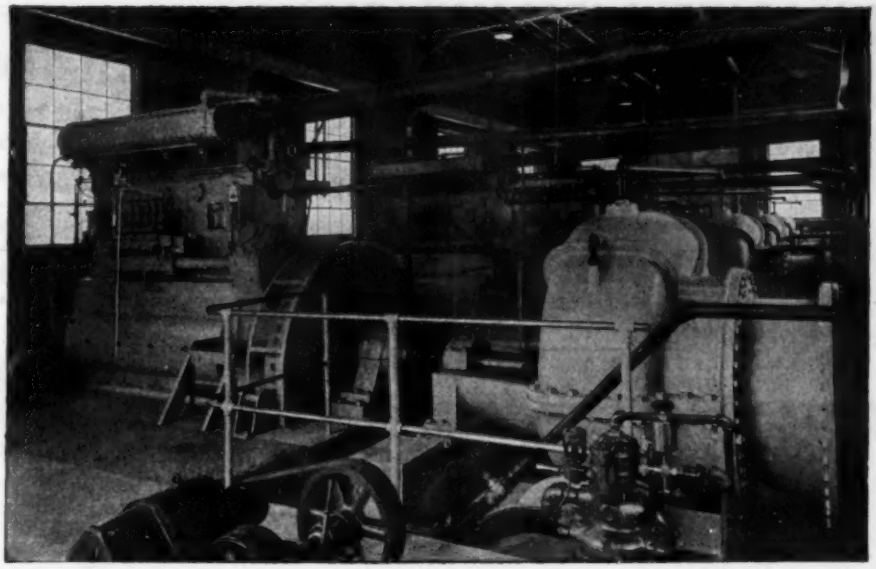
At the APHA meeting in N. Y. just finished, two display booths impressed us . . . one was the free Coca Cola bar, and the other was the Wallace and Tiernan Booth which showed three pictures taken with the Electron Microscope. These three pictures showed a typhoid bacterium before, during, and after treatment with chlorine. Very impressive!

* * *

It seems strange, doesn't it, to write to a bank about problems in sewage treatment. But from "Results from Research" a bulletin published by the Research Advisory Service of the Liberty Bank of Buffalo, N. Y., we learn that some one wrote asking what to do about roots in sewers, to prevent them from entering joints of the sewer and causing stoppages. The answer was, "One company offered a jointing compound believed to solve the problem. A similar chemical was nationally advertised for destroying roots and keeping sewers open. In addition, electrical machines for boring through clogged lines were mentioned. Most strongly recommended was filling the joint space with solid material. Asphaltic compounds, hot poured in place, were said to be most effective." The bank also had an inquiry about discharging industrial wastes into wells.—After querying several consultants they gave a very good answer, "No."—Last month we practically offered to go into competition with the Research Advisory Service, by suggesting that we will obtain answers from experts on water and sewage problems for any one writing to us.

* * *

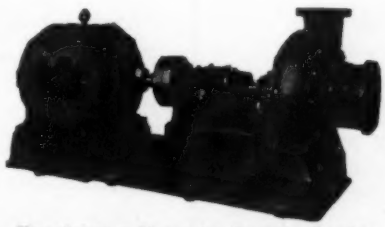
At least one editor we know was a happy man at breakfast at the Boston NEWWA meeting, when Fred Reny of Portland, Me., brought forth some real Maine Doughnuts, than which there is no whicher.



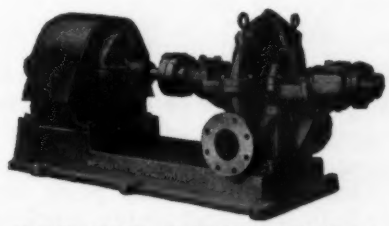
CONVINCING THE SKEPTICS . . .

impossible?

The favorite job of the Morris Engineers is to prove how often the "*impossible*" is possible in pumping operations. Many are the instances in which Morris Pumps are developing "*impossible*" efficiencies, handling "*impossible*" mixtures, operating under "*impossible*" conditions, and lasting "*impossibly*" long. If you have a difficult problem involving the handling of liquids or materials in suspension, don't give it up, give it to the Morris engineers. They'll give you the answer.



Non-clogging Pump for Sewage Service



Double Suction Horizontally Split Pump for Water

MORRIS MACHINE WORKS
Baldwinsville, N. Y.

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ESTABLISHED 1864

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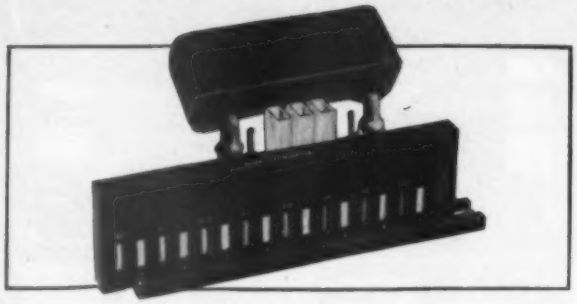
CENTRIFUGAL PUMPS

CHLORINE DETERMINATIONS



Quickly...Accurately!

The Taylor-Enslow Slide Chlorimeter is particularly valuable in water purification and sewage plants. It makes possible speedy, sure determinations of free or residual chlorine. Made of molded plastic, it will last a lifetime. Its accuracy is unfailing, for all Taylor color standards carry an *unlimited* guarantee against fading. Price **$18.50.**

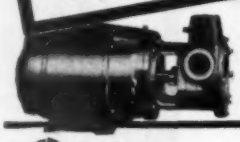
In wooden carrying case, **$23.50**
F. O. B. Baltimore.

See your dealer or write direct for free booklet.

W. A. TAYLOR AND CO.
7308 YORK RD. • BALTIMORE-4, MD.

Westco PUMPS
Serve All Industries Large and Small

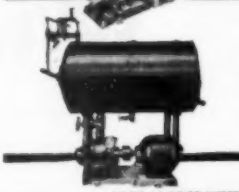
There is a size and type of Westco unit to meet important water moving requirements in practically every industry. Among the wide range of Westco equipment, the following are typical:



THE WESTCO UNIBILT PUMP
...an extremely compact, rugged pump for general purpose applications at low and medium heads. Ideal as sump pump, pressure pump, circulating pump, etc., where space is a limitation. Capacities to 100 GPM. Heads to 300 ft. Both self-priming and non-self priming types.

THE WESTCO FLEXIBLE COUPLING PUMP
...recommended for general purpose applications at medium and high heads. Excellent for water supply service, heavy duty pressure and circulating work, etc. Capacities to 200 GPM. Heads to 500 ft. Self-priming and non-self-priming types. For hot and cold liquids.

WESTCO CONDENSATE RETURN UNIT
...returns condensate to boiler at highest possible temperature, effecting important fuel savings. Automatically compensates for extreme head variations, assuring positive return against fluctuating pressures. Compact, rugged. Sizes to 100,000 sq. ft. of radiation. Pressures to 150 lbs.



WESTCO BOILER FEED UNIT
...insures uniformly-even boiler feed to maintain highest possible boiler temperatures with minimum firing. Automatically maintains uniform water level and steam space in the boiler, increasing boiler efficiency. Internal Make-up type for boilers to 25 HP. External Make-up for boilers to 750 HP.

NEW 64-PAGE WESTCO CATALOG. SEND FOR YOUR FREE COPY.

JOSHUA HENDY IRON WORKS
Pomona Pump Co. Division
2621 Locust Avenue ST Louis 3 Missouri

HAVE YOU AN IDEA?

A prominent machinery manufacturer is looking for new devices which are marketable to the sewage field. If you have or know of any salable mechanical devices of this type, please communicate with the undersigned.

If the device or devices have been thoroughly tested and are in a position for marketing, we would consider employing a qualified person on a full or part time basis for the marketing of the product.

We have no definite ideas as to the way our mutual arrangements could be worked out, but this can be arranged on some mutually profitable basis after full discussion.

We would be interested in anything which could be produced in a very modern machine tool manufacturing plant with facilities for both light and heavy machinery.

If you know of any such device we will be glad to discuss a mutually profitable arrangement with you.

Address: Manufacture,
c/o Thomas & Associates,
100 W. Monroe St.,
Chicago, Illinois

VALVES and FITTINGS
RECONDITIONED and GUARANTEED

Complete Stock—Cast Iron—Cast Steel
—Forged Steel

Special Offering

13—18" 150-lb. Cast Steel Gate Valves, Flgd. OS&Y, R.S., D.D.—18½" Face to Face. Price $946.94.

2—18" 150-lb. Cast Steel Gate Valves, Flgd. OS&Y, R.S., Wedge, 17" Face to Face. Price $946.94.

SEND US YOUR INQUIRIES

Refinery Equipment, Inc.

W. C. Berry
Union Ave. at 21st Street

Robert W. Duden
Tulsa, Oklahoma

At the NESWA meeting in Boston, we heard considerable comment on the way the Navy had handled sanitation problems of shore installations and camps. Not all of the comments were casual either, some were direct, forthright, and critical and made by speakers on the program. We also heard it rumored that the Navy was planning a Sanitary Corps, similar to that of the Army. At the APHA meeting in New York, Lt. Commander C. L. Pool, told the story behind the rumor. There will be sanitary engineers attached to the staffs of some seven Superintending Civil Engineers in various locations in the country. If you are interested write to Lt. Cmmdr. C. L. Pool, U. S. Navy, Room 4422, Navy Bldg., Washington, D. C.

MANUFACTURERS' and EQUIPMENT News

"Bob White" Locator of Buried Boxes

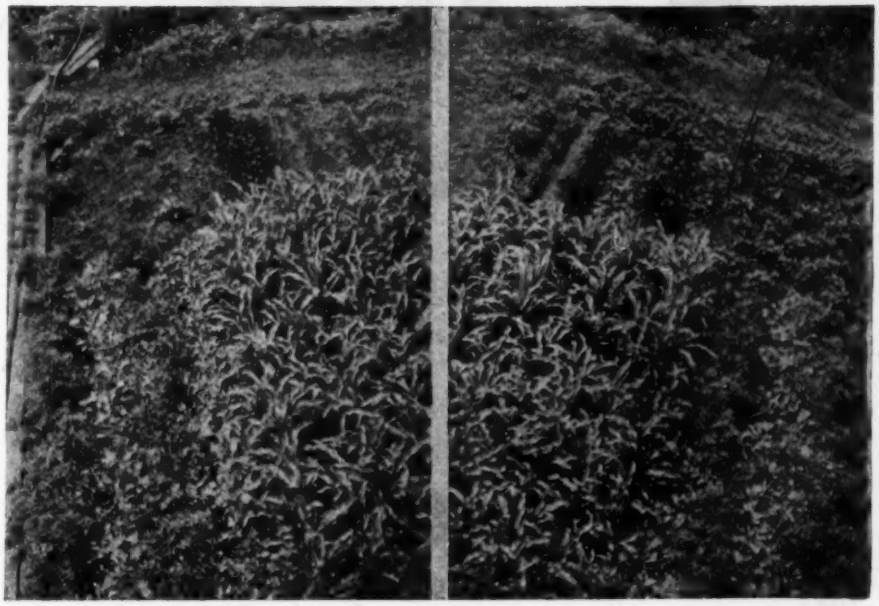
Ferguson and Pascoe of Newark, N. J., have developed something new in the line of Box Locators which takes the form of a precision instrument and demonstrated for the first time publicly at the recent New England Water Works Convention.

Dubbed the "Bob White" because of the sound made in the ear receivers of the instrument, this new Electronic Box Locator was developed for accurate, speedy location of buried curb, meter, valve and drip boxes, manhole lids, sewer cleanouts and lamp-holes.

The illustration pictures an operator as he walks along swinging the locating disc (loop aerial) a short distance above ground or paving. Above or at the edge of a metal box-lid, the amplifier worn over the shoulder sends the bob-white signal to the ear phone. Fact is, the signal is so audible that the earphone may be carried in the pocket of the operators. As soon as the edge of the loop disc is over one edge of a box cover, the signal sounds. Thereafter, by swinging or rotating the disc,

Gardens Responding to Sludge!

without with



In communities all over America, more sewage sludge was applied to gardens this year than ever before. The use of properly prepared sludge is here to stay—it has won its case in gardens like the one shown above. The plot at left was not sludged, and the one at right was treated with a ton of sludge. Both plots were 10' x 35'. The sludged plot so far has yielded far more than the other and has been more resistant to heat and severe rains.

America's sewage treatment plants using Royer Sludge Disintegrators can produce an abundance of high quality fertilizer—all we need. Royers shred, mix, aerate and further dry sludge cake right from the drying beds. Their operation is fast, simple and thorough. Cost per ton of prepared material is infinitesimal. The cost of the Royer is surprisingly low, too! Send for informative "Sewage Sludge Utilization Datalog".

Royer "Jr." with gasoline engine—one of 12 models: gasoline, electric and belt-to-tractor driven; portable and stationary.

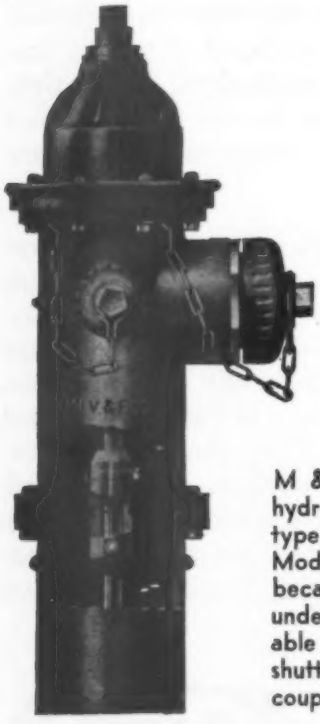
THE ROYER

ROYER FOUNDRY & MACHINE CO.
170 PRINGLE ST., KINGSTON, PA.

M & H

VALVES
HYDRANTS
and
WATER WORKS
ACCESSORIES

Shown above is a 30-inch manually operated M & H Gate Valve, ball-bearing and rising floor stem, for the new Water Filtration Plant at Mobile, Alabama. We furnished hydraulically operated Valves and manually operated Valves for this Filtration Plant, just completed with a capacity of 20,000,000 mgd. Expert workmanship and highest quality materials make M & H products dependable.



OTHER M & H PRODUCTS

SQUARE BOTTOM GATE VALVES
TRAFFIC MODEL FIRE HYDRANTS
CHECK VALVES—FLAP VALVES
TAPPING VALVES—MUD VALVES
FLOOR STANDS—EXTENSION STEMS
SHEAR GATES—SLUDGE SHOES
FLARED FITTINGS
B & S FITTINGS
FLANGED FITTINGS
WALL CASTINGS
TAPPING SLEEVES
VALVE BOXES
SPECIAL CASTINGS

Write for Catalog 34

M & H furnishes both regular type A.W.W.A. fire hydrants and special Traffic Model—all compression type, dry top and revolving head. Special Traffic Model (shown at left) is growing rapidly in popularity because it is designed to yield at the ground line under impact, due to its breakable bolts and breakable coupling on stem. Repair then is easy without shutting off pressure. Simply install new bolts and coupling.

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

the exact center of the box may be located and the spot marked for digging.

The "Bob-White" is not affected by a snow or ice covering, small bits of metal, overhead wires, electrical fields or passing automobiles, as some other locators are. A 4-inch

curb box may be located 6 to 10 inches under ground surface, an 8-inch box 8 to 10 inches, and a manhole cover through 12 to 14 inches of cover. The instrument, which attracted considerable interest in Boston, is nominally priced.

For descriptive literature and further details write Ferguson and Pascoe, 11 Hill St., Newark 2, N. J.

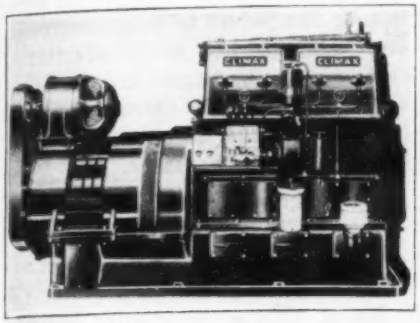
Climax Enters Diesel Engine Field

The production of two solid injection, compression ignition engines has just been announced by Climax Engineering Co. of Clinton, Ia. These prime movers are additions to the company's extensive line of "Blue Streak" gas engines, generating sets, and complete accessory equipment. Both new Climax Diesels are 4-cycle, full Diesels and intended for use in driving electric generators, primary drives for pumps, compressors, etc.

Model D148 is a two-cylinder unit with a maximum rating of 22 h.p. Model D297 is a four-cylinder unit with a maximum rating of 44 h.p. and may be used to power a 30 kva. generator.

Among the features that make Climax Diesels reliable, low cost power plants are: One piece crankcase and

cylinder housing, for rigidity and maintained alignment; replaceable chrome nickel iron cylinder liners for economical and infrequent maintenance; water cooled exhaust manifold providing cool running under almost all conditions; simple design to make all parts accessible for in-



spection; small space requirements.

For further details concerning these new Diesels address Climax Engineering Co., Clinton, Iowa.

Don't Waste Water!

(A Well Timed Poster)

As a companion piece to the poster prepared on "Water Workers *are* War Workers," the Industrial Chemical Sales Division of the West Virginia Pulp and Paper Co. has prepared another attractive and impressive poster to aid in the national conservation program to save water, gas, coal, and electricity as an aid to the war effort.

On display for the first time at the NEWWA convention in Boston, this well designed 9¼x12¼ inch poster (printed attractively in red, blue and black, and absolutely void of advertising) proclaims that *"It takes men and materials to bring*

IT TAKES Men AND Materials
TO BRING WATER TO YOUR TAP
Don't Waste Water
Water is one of the basic essentials of life... and of war. Without water, planes, guns, tanks, ships, etc., cannot be produced. There is plenty for essential use ... drinking, cooking, washing, cleaning and manufacturing purposes... but not a single drop for waste!
It is our patriotic duty to conserve it.
STOP letting water run needlessly.
STOP leaks in faucets and fixtures.
STOP non-essential use of hose and above all avoid creating fire hazards from accumulated papers and trash in cellars and attics. You save water when you prevent fires.
AID THE WAR EFFORT... USE WATER WISELY
3 WAYS TO HELP CONSERVE WATER
STOP DRIPPING FAUCETS
STOP RUNNING WATER YOU DO NOT USE
STOP RECKLESS USE OF HOSE

HYDRODARCO QUALITY

Shows Up in Performance

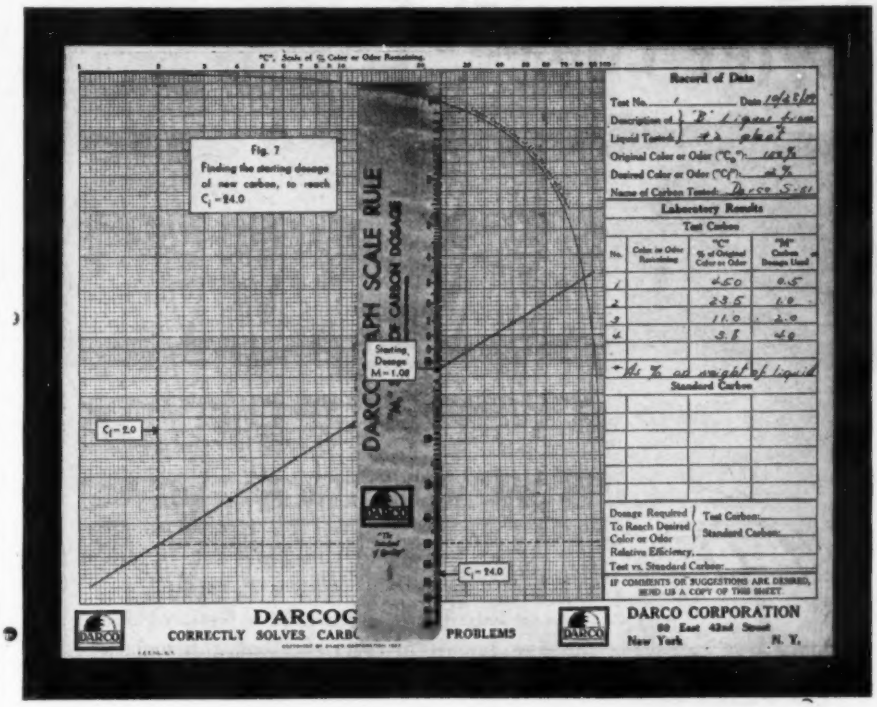


Fig. 7
Finding the starting dosage of new carbon, to reach C1 = 24.0
DARCOGRAPH SCALE RULE
OF CARBON DOSAGE
Starting Dosage M = 1.08
C1 = 2.0
C1 = 24.0
Record of Data
Test No. 1 Date 10/28/41
Description of Liquid Tested: #2 plant
Original Color or Odor ("Co"): 120 %
Desired Color or Odor ("C1"): 24 %
Name of Carbon Tested: Darco S-51
Laboratory Results
Test Carbon
No.
Color or Odor Remaining
"C" % of Original Color or Odor
"M" Carbon Dosage Used
1 450 0.5
2 235 1.0
3 110 2.0
4 58 4.0
* As % on weight of liquid
Standard Carbon
Dosage Required To Reach Desired Color or Odor
Test Carbon:
Standard Carbon:
Relative Efficiency:
Test vs. Standard Carbon:
IF COMMENTS OR SUGGESTIONS ARE DESIRED, SEND US A COPY OF THIS SHEET.
DARCO
CORRECTLY SOLVES CARBO PROBLEMS
DARCO CORPORATION
60 East 42nd Street
New York N. Y.

The Darcograph—one of the 3 performance tests evolved by Darco for water works men.

Hydrodarco is not only the quality activated carbon, but the carbon specially made for water treatment.

Depend on it to do a complete job of purifying—with maximum palatability control per dollar.

With the Threshold Odor Test, the Carbon Feed Chart and the Darcograph, you can check Hydrodarco performance right in your plant. The results will not disappoint you.

Information about these simplified, scientific methods of evaluating carbon efficiency is available at your request.

Hydrodarco Reg. U. S. Pat. Off.

HYDRODARCO
REG. U. S. PAT. OFF.

DARCO
CORPORATION

60 East 42nd St., New York 17, N. Y.

DISTRIBUTING POINTS: New York • Cincinnati • St. Louis • Buffalo • Chicago • Kansas City • San Francisco • Los Angeles • Marshall, Texas

☆ ☆ ☆

REILLY Pipe Enamel gives dependable protection to steel water lines under all conditions of soil and climate. The tough, durable REILLY coating prevents corrosion from all causes, resists abrasion and soil stress, and withstands wide variations in temperature without sagging or cracking.

As an inner lining on water lines REILLY Enamel protects against incrustations and tuberculation, and assures full capacity flow for the life of the pipe.

On storage tanks, stacks, structural steel and other metal surfaces, REILLY Coal Tar Paints give effective, economical protection against corrosive vapors and gases.

Booklet describing REILLY Protective Coatings will be sent on request.

Reilly
COAL TAR
PRODUCTS

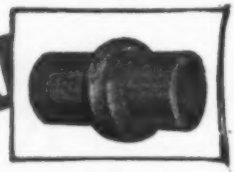
REILLY TAR & CHEMICAL CORPORATION

Executive Offices. Merchants Bank Building, Indianapolis, Indiana

2513 S. DAMEN AVENUE, CHICAGO, ILLINOIS 500 FIFTH AVENUE, NEW YORK, N. Y. ST. LOUIS PARK, MINNEAPOLIS, MINN.

SEVENTEEN · PLANTS · TO · SERVE · YOU

WESTON



GASKET AND FORM
The Perfected Method for Making
SEWER PIPE JOINTS OF CEMENT

- No jute used—gasket centers spigot.
- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

L. A. WESTON Adams, Mass.

EDSON
DIAPHRAGM PUMPS

Hand Sizes 2", 2½", 3", 4"
Power Sizes 3" and 4"
Open Discharge or Force Pump
Edson Special Suction Hose
Red Seal Diaphragms
Strainers and Foot Valves
Hose Spanners—Adapters

THE EDSON CORPORATION
Main Office and Works: 49 D St.
South Boston, Mass.
New York: 142 Ashland Pl., Brooklyn

water to your tap," and admonishes, *"Don't Waste Water."*

At the bottom of the poster are pictured three ways in which consumers can help conserve water. Hung in the window of the water works office, or used as text in waste reduction campaigns, this poster reminding the public to help conserve water should be most effective. Copies may be had from Industrial's New York City office merely for the asking. For the address see this company's ad. in this issue.

"Aquella" A New Waterproofing Paint

Aquella is the tradename of a waterproofing mineral paint in the form of a white powder composed of properly balanced inorganic ingredients. Due to its minutely dispersed aggregates, Aquella closes the smallest pores of a wall, when applied to a surface of wet unpainted brick, cement or concrete wall. In developing the waterproof membrane a permanent bond is formed with the wall itself.

This new paint may be used on basement interior walls, tunnels, subterranean rooms, vaults, swimming pools, or any place subjected to dampness, moisture, or water seepage.

"Aquella" is white, but may be colored at the time of preparation by the introduction of a small quantity of colored metal oxide, or by covering the "Aquella" coat with colored paint. This waterproofing material is not intended for application on hard plaster or any other non-porous building material.

"Aquella" has been thoroughly tested as to its waterproofing qualities on masonry walls of clay, brick, and concrete blocks. The manufacturer states that areas of 200 square inches of brick wall which had leaked 10 gallons of water per hour were kept dry after two coats of "Aquella" had been applied. And, concrete walls which allowed seepage of more than 20 gallons of water per hour had this permeability stopped by the application of two coats of "Aquella."

This new waterproofing paint may be obtained in containers of from 4.2 to 100 lbs. It is offered by the Modern Waterproofing Paint Co., 1270 Sixth Ave., Rockefeller Center, New York, N. Y.

"Bob" Mannheim Says Wrong Impression Created by W.W.&S. Announcement

As the result of an announcement in our September issue to the effect that "Bob" Mannheim, New England manager for Mathieson Alkali had become Vice President of Chem-Feeds-Inc. Mr. Mannheim advises that an erroneous impression has resulted.

Facts in the case are, as we now understand it, that Mr. Mannheim was only temporarily a vice-president of Chem-Feeds-Inc., which came about through a friendship act in the process of getting the new company incorporated and carried with it no financial interest in Chem-Feeds.

At Mr. Mannheim's request, in an effort to correct a false impression which has apparently been created by the news item in our September issue, we herewith reproduce a statement from him.

Dear Mr. Enslow:

In the September 1943 issue of WATER WORKS AND SEWERAGE there appeared a picture of me together with a news item stating that I had been made a Vice President of Chem-Feeds-Inc. of Providence, Rhode Island.

Release of this announcement was made without my authorization, and I would like to advise that my connection with Chem-Feeds-Inc. has been completely severed.

If you will publish this letter in your next issue I will greatly appreciate your courtesy.

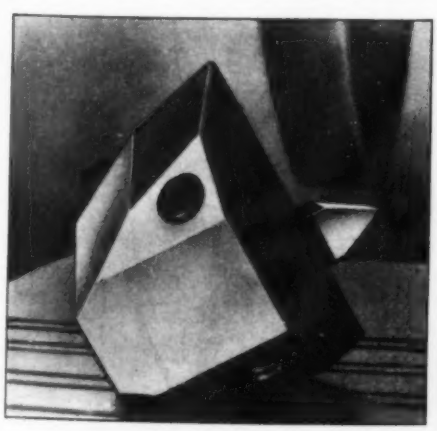
Yours sincerely,

Cranston, R. I.
October 7, 1943.

L. ROBERT MANNHEIM

Clark Thread Tool Grinding Fixture

A new and unique thread-tool grinding fixture for grinding both 60° and 29° threading tool bits with extreme precision has been announced by the Robert H. Clark Co. of Los Angeles. This new fixture has no graduated scale or moving parts. The machinist merely slides the bit into the holder, tightens a set screw and places the fixture on the grinder work table, properly positioned for the thread angle desired. This automatically holds the bit securely and precisely at the desired angle to the grinding wheel. The design of the fixture makes it especially adaptable for use with a magnetic chuck, or it can be clamped to a work table.



The new fixture is available in two standard sizes, each of which takes all tool bits within a ⅛-in. to ⅝-in. range. One model is for the mechanic's tool kit, the other a heavy-duty shop model. The manufacturer is also equipped to provide fixtures for other dual combinations.

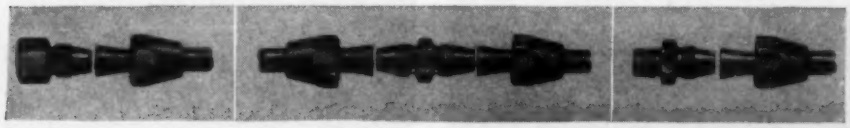
For full information, specifications and prices, write to Robert H. Clark Co., 3424 Sunset Boulevard, Los Angeles 26, Cal.

"HERE - READ THIS! IT TELLS WHY I AM USING SUPERSEAL FITTINGS AND TUBE-LOY PIPE ON MY MAIN TO METER HOOK-UPS."
SUPERSEAL Flared Tube-Loy Fittings and ASARCO Type K Tube-Loy for Main to Meter Water Service
SUPERSEAL Flared Tube-Loy Fittings
Made of malleable iron, electro-galvanized.
Long tapered cone provides greater seating area for tubing flare . . . forms a leak-proof joint unaffected by vibration.
Three types available—tube to inside iron pipe thread . . . tube to outside iron pipe thread . . . tube to tube.
Tubing easily flared to SUPERSEAL's 10° angle with wood flaring top and tube holder.
ASARCO Type K Tube-Loy
Tubing extruded from a lead alloy . . . has all of lead's unequalled resistance to corrosion.
Uncoils readily and can be easily bent around obstructions.
Installation requires less effort than heavy walled lead pipe or relatively hard non-ferrous tubing.
Nominal sizes — ½", ¾", 1".
Stock coils — 30', 45', 60', 100'.
BOTH AVAILABLE RIGHT NOW

This combination, made of non-critical materials, offers the advantages of easy handling for fast installation, long life, leakproof connections and trouble-free service.

Call your nearby Grinnell Branch for complete information and catalog, or write Grinnell Company, Inc., Executive Offices, Providence, R. I.

GRINNELL
WHENEVER PIPING IS INVOLVED



HANDS THAT WILL COME BACK

War scarred hands — deserving hands — will be coming back.

It is our job, and your job, to see to it that those hands that protected us do not suffer the humiliation of idleness.

HILL-HUBBELL'S postwar plans are being readied for action!

As always, since our beginning in 1928, we shall continue to provide you with Steel Pipe Protection of real quality.

Write today for detailed information contained in "THE BOOK OF PIPE PROTECTION."

GENERAL PAINT CORPORATION
HILL, HUBBELL & CO. • Division • Cleveland, Ohio
• EXPORT OFFICE: SAN FRANCISCO, CALIFORNIA, U. S. A. •

Simplification and Economy Through WPB Limitations on Sewer Pipe Manufacture

On September 25, 1943, the War Production Board issued Limitation Order L-316 defining permissible vitrified clay sewer pipe items which may be manufactured after October 25, 1943.

Hereafter, all production of clay sewer pipe must conform to U. S. Specification SS-P-361a, with fittings and appurtenances in accordance with a prescribed schedule of sizes and types. In the states of Washington and California, however, the standards are slightly different than for the remainder of the country. U. S. Specification SS-P-361a covers both "standard" and "extra strength" pipe. Standard pipe, as specified, is practically identical with conventional double strength clay pipe, usually specified by reference to A.S.T.M. standards: Designation C-13-40.

Limitation Order L-316 simplifying clay pipe production was promulgated to conserve manpower, and to standardize production in all plants so that hauls can be reduced to practical minimums. There is no restriction on the total quantity of pipe and fittings which may be produced.

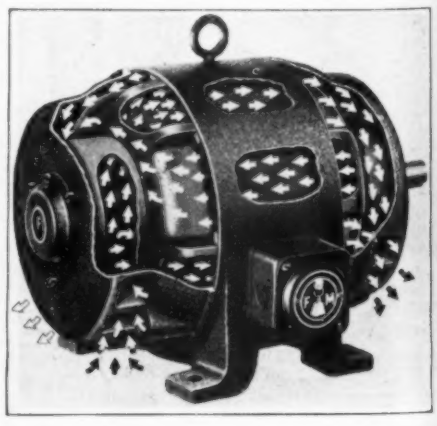
Incidentally, the Order itself is a sort of uniform catalogue of clay pipe products giving details of each permitted item.

New Type All-Purpose F-M Motor

Fairbanks-Morse has announced a new type, all-purpose, continuous-duty, Polyphase Squirrel-Cage Induction Motor, for use in all kinds of industry.

This new motor is in the manufacturer's term "protectioneered," and embodies many special and vital features of interest to motor users.

Constructed with the centrifugally-



ZECO GREENSAND ZEOLITE

ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.

ZEOLITE CHEMICAL CO.
Sales Office 116 Cedar St., New York, N. Y. Factory Medford, N. J.
Pioneer Producer of GREENSAND ZEOLITE MINERAL

ANTHRAFILT
A Filter Medium For All Purposes

ANTHRACITE EQUIPMENT CORP.
101 Park Ave. New York

H. G. Turner Research Engineer
STATE COLLEGE, PA.

cast F-M Copperspun Rotor, this new motor is fully protected against flying or falling particles, dripping liquids, and other motor hazards. The ball bearings sealed in cartridge-type housings minimize expensive shut-downs due to bearing failures. Cross-flow ventilation, to insure uniform cooling and preclude hot spots, is obtained through protected inlets and exhausts at each end of the motor.

Regardless of the position of the motor, complete safety for the operator is assured because there are no moving external parts. The frame is cast in one piece with rib sections to give added strength without increase in weight.

The new motor is rated 40° C. and designed to carry 115% load continuously without injurious heating (1.15% service factor).

More complete information may be obtained from your local Fairbanks-Morse representative or by requesting Bulletin No. 1160, from Fairbanks, Morse & Co., Chicago, Ill.

Stuart Saks of Morris Machine Works Dies

News releases of recent date carried the story of the death on Sept. 5 of Stuart J. Saks, president of the Morris Machine Works of Baldwinsville, N. Y. Mr. Saks was a veteran of World War I and was known as the "King of Paris" when he was assistant provost marshal after the armistice, handling cases of all soldiers AWOL in Paris.

Following the war Mr. Saks was in newspaper work for a time and served the INS in New York and the AP in Philadelphia before turning to manufacturing. He had had executive positions with several companies before joining the Baldwinsville company about three years ago. Mr. Saks became president of the company two years ago.

"Utaloy"—New Alloy Steel

"Utaloy" is an alloy steel product of the Eimco Corp. of Salt Lake City. Not just an alloy of hit or miss qualities "Utaloy" has a combination of elements that give it extra toughness both to impact and abrasion. This new alloy steel was developed from experience with super-molychrome steel. The production of Utaloy is dependent on the most modern heat-treating and quenching equipment controlled by electronics. Utaloy is designed for use in such applications as ball mill liners, jaw crusher plates, elevator buckets, bin

SMITH
TAPPING MACHINES
THE A. P. SMITH MFG. CO. EAST ORANGE, N.J.
Symbol of Quality Since 1889
PROTECTOP
Trucks and motor cars back into fire hydrants every day. When this happens to a Smith Protectop Hydrant the break occurs only at one place and the only parts needing replacement are the frangible standpipe clamp and the frangible cast iron stem section. These parts cost comparatively little and they make it easy for full repairs in 15 minutes. The valve is of the compression type and even should it be open at the time of the break, it will instantly close, preventing any possibility of flooding. Made in all sizes and types.
OTHER SMITH PRODUCTS
Valves and Hydrants — Valve Inserting Machines — Tapping Sleeves — Tapping Valves — Hat Flanges and Water Meters
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THE HYDRANT THAT CAN BREAK AT ONLY ONE PLACE
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901 Wm. Oliver Bldg., Atlanta, Ga.
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524½ First Ave. S., Sattle, Wash.
1317 Oakley St., Orlando, Fla.
THE A. P. SMITH MFG. CO., EAST ORANGE, N. J.

THE Phipps & Bird LABORATORY MIXER . . .
IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.
PHIPPS & BIRD, INC. Richmond, Va.

SAVE MONEY USE ACTIVATED ALUM and BLACKALUM
STUART-BRUMLEY CORP.
516 North Charles St.
Baltimore Maryland

DEPENDABLE • EFFICIENT PUMPING FOR LOW COST

SEWAGE DISPOSAL and WATER SUPPLY

Scores of municipalities and industries throughout the country rely on the Johnson Right-Angle Gear Drive for use in pumping operations. This drive was designed as a "connecting unit" between the deep-well turbine or sewage pump and the power unit. Reduces shut-downs; gives 24 hour efficient service; lowers pumping costs.

JOHNSON *Right Angle* GEAR DRIVE

GET COMPLETE DETAILS

through the local representative of Pump and Engine Manufacturers. These drives are manufactured in a wide range of sizes to meet the specifications for most applications — Sewage Disposal; Water Supply; Fire Fighting; Flood Control, etc. Write for Catalogue No. 12.

★ DEPENDABLE
★ ALWAYS ON DUTY
★ LOW COST OPERATION
★ OCCUPYS LITTLE SPACE
★ FULLY ENCLOSED
★ UNUSUAL LONG LIFE

JOHNSON GEAR & MANUFACTURING CO., LTD.
MAIN OFFICE AND WORKS: BERKELEY, CALIFORNIA

IMPROVED JOINTING COMPOUND

Tegul- MINERALEAD

for Bell & Spigot Main

- Sulphur base; quick sealing, speeding laying and backfilling.
- 10 lb. ingot form, easily handled, stored and shipped. Impervious to rain. Cannot change composition.
- Makes permanently tight joints. Goes 3 to 5 times as far as lead, helping conserve a strategic war metal.
- For money-saving information, write

The ATLAS MINERAL Products Company of Pa.
Mertztown Pennsylvania

BUY WAR BONDS

liners and other equipment subject to impact or abrasion. Its use in grinders, elevating equipment, and scraper mechanisms in sewage plants is another field of application. Complete information on "Utaloy" may be obtained by writing The Eimco Corp., Salt Lake City 8, Utah, or to branch offices in New York, Chicago, El Paso, and Sacramento.

Founder of Hardinge Co. Dies

Hal W. Hardinge, mining and metallurgical engineer and inventor, Chairman of the Board of the Hardinge Company, Inc., York, Pa., died on September 15th at his home in Forrest Hills, N. Y.

Mr. Hardinge, who held patents on more than 60 devices, first developed the conical ball mill used in the grinding of ores. This lead to the development of classifiers, feeders, agitators, pumps and thickeners for use with the mill in the treatment of ores. The thickener was similar to the clarifiers used in the Sewage and Water treatment field and in 1926 the Hardinge Co. entered this field with the circular clarifier and digester followed by the rectangular clarifier.

E. G. Warren Succeeds "Ted" Wilson as Philadelphia Territory Representative for Penn. Salt

Edgar G. Warren of Philadelphia has been assigned by the Pennsylvania Salt Mfg. Co. to the Heavy Chemicals Division to take over the Philadelphia territory. This territory was formerly covered by Lieutenant E. M. Wilson before he entered the military service.

The Dorrco Vacuator

The Dorrco Vacuator is a new unit developed primarily for the removal of grease and light, difficult-to-settle solids from sewage and trade wastes, prior to clarification by plain subsidence.

The basic principle upon which the Vacuator operates is described as follows: "When sewage or trade wastes are aerated, the larger air bubbles rise rapidly and escape to the atmosphere, while the finer bubbles liberate themselves slowly at ordinary pressures. When a vacuum is applied immediately after the large bubbles have escaped, the minute bubbles are released rapidly and attach themselves to light suspended solids particles, carrying them to the surface."

This action requires three steps: First, aeration, in a mechanical aerator, where a maximum of finely divided air bubbles are entrained in the feed to produce an air emulsion. Second, de-aeration in a small compartment or connecting channel, where the larger air bubbles that might cause surface disturbance are released. (These two steps take place outside the tank proper.) Third, flotation and removal of the light solids fraction under partial vacuum in the Vacuator itself.

The Dorrco Vacuator (see page 98) consists of a cylindrical tank with a dome-shaped cover, in which a constant vacuum of approximately nine inches of mercury is maintained. After the flash deaeration, the feed containing the emulsified air enters the tank through a central draft tube. Floated solids, buoyed up by the fine air bubbles released by the vacuum, collect on the surface, from which they are continuously removed by means of a special rotating mechanism.

Coarse solid particles, that settle out to the bottom of the tank, are raked to a central sludge outlet by means of a bottom mechanism. Both rotating mechanisms are driven by a central drive mounted on the top of the tank.

Two types of Dorrco Vacuators are available in sizes ranging from 10 to 60 feet in diameter. Tank construction is usually of concrete, although steel may advantageously be used in the smaller sizes.

The "constant level" type, adaptable to the great majority of applications is used where the grease or light solids fraction is fairly solid and viscous, and where some heavier solids are also to be removed.

The "variable level" type is particularly adaptable to conditions where the floating material is very light and cannot readily be raked up a ramp.

Some of the major applications of the Vacuator include the removal of grease and scum in sewage, prior to clarification, treatment of cannery wastes, packing house wastes, tannery wastes, gelatin plant wastes, oil refinery wastes, and laundry wastes.

Advantages of this new type equipment include separation of (a) grease, scum or light solids fraction and (b) sludge containing substantial quantities of grit. Improved effluent or subsequent treatment; elimination of odor nuisance; high overflow rates and low detention periods; low power requirements; low installed cost; and less ground space required, constitute

He Does More Than MAKE Them

Manufacturing sanitation equipment is only part of his work.

His business is mechanical engineering, the design . . . manufacture . . . application . . . selling and maintenance of special apparatus for sewage disposal and water-treatment.

In order to properly design and manufacture his products, Rex Mechanical Engineering—Rex M. E.—must also perform the functions of application and selling. These are, in some ways, his most important obligations to the Sanitation Engineer.

Application and selling are technical information services provided by specialists to help the sanitation engineer analyze his difficulties and find the best ways for surmounting them.

For this service Rex Mechanical Engineering—Rex M. E.—maintains a territorial organization. Many of the men in it have served their apprenticeship in his drafting rooms and plants. For additional counsel, these field men call on his designing engineers in Milwaukee who have the advantages of national experience.

Through the work of all these men in many fields, Rex M. E. is learning—and making available—much that is helpful in the great work in which all engineers are engaged, namely, to achieve a maximal result at minimal cost and waste. For complete information write Chain Belt Company, 1610 W. Bruce St., Milwaukee, Wis.

Tow-Bro Sludge Remover

Slo-Mixer

Bar Screen

Thickener

REX **SANITATION EQUIPMENT**

Triturators • Bar Screens • Tow-Bro Sludge Removers • Slo-Mixers
Aero-Filters • Rapid Mixers • Grit Collectors and Washers

CHAIN BELT COMPANY OF MILWAUKEE

Style 705 MERCURY FILTER CLOTH

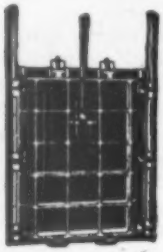
Designed for Sewage and Disposal Plants

This all wool Mercury Filter Cloth is made from specially processed wool. Our 30 years of experience have proven that this wool withstands deterioration better and longer than other filter fabrics. Send us dimension of fabric you now use—we will be pleased to submit samples, price and full particulars.

Mercury

TECHNICAL CLOTH AND FELT CORPORATION ★ 1265 Broadway, New York, N. Y.

RODNEY HUNT



GATES and HOISTS

Metal or timber sluice gates of all sizes and designs, approved by engineers everywhere. Improved gate stands and hoists for hand or motor operation. Also flap and mud valves, shear and filler gates, trash racks and rakes. Dependable canal equipment from dam to tail-race since 1840.

Write for Special Catalog Today!

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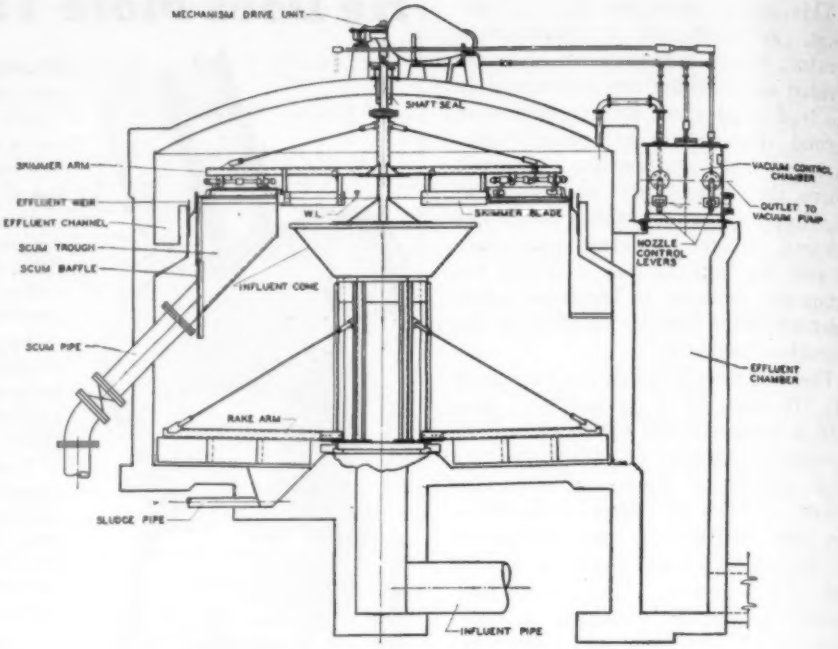
RODNEY HUNT MACHINE CO.
118 Lake St., Orange, Mass., U. S. A.



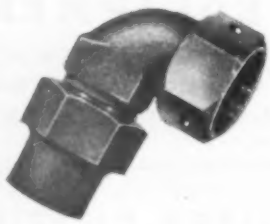
SECTIONAL ELEVATION

operational and design advantages.

At the present time there are two units treating cannery wastes, five being used for the pretreatment of sewage, and a number more recovering rubber fines from waste water at synthetic rubber plants. A new brochure describing this interesting new adjunct to sewage and waste treatment may be had from Dorr Co., General Electric Bldg., Lexington Ave., New York City.

Ringstyle COUPLINGS

The first improvement in water meter couplings in fifty years.



RINGSTYLE Couplings connect direct to copper tubing or iron pipe, saving pipe joints and fittings. Made in straight and angle patterns. Let us send you a sample.

FORD METER BOX CO.
WABASH, IND.

No Shortage of IDEAL RECHARGEABLE STORAGE BATTERIES *for* FLASHLIGHTS

OUTLASTS 400 DRY CELLS!

While dry cells are drastically restricted, you can buy IDEAL Rechargeable Storage Batteries for flashlights. Can be recharged again and again at convenient intervals, providing an "always fresh" battery and a bright, steady, dependable light.

CHARGERS . . .
Plug into any light socket.

GUARANTEED
Write for Bulletin F.B.B. 1242.

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HEAVY-DUTY INCINERATION
MORSE BOULGER
DESTRUCTORS

FOR THE

INCINERATION OF MUNICIPAL WASTES

GARBAGE, RUBBISH,
SEWAGE SCREENINGS
AND SLUDGE

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FOR COMPLETE INFORMATION
CALL OR WRITE

MORSE BOULGER
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HOME OFFICE:
216-W East 45th St., New York, N. Y.

LITERATURE AND CATALOGS

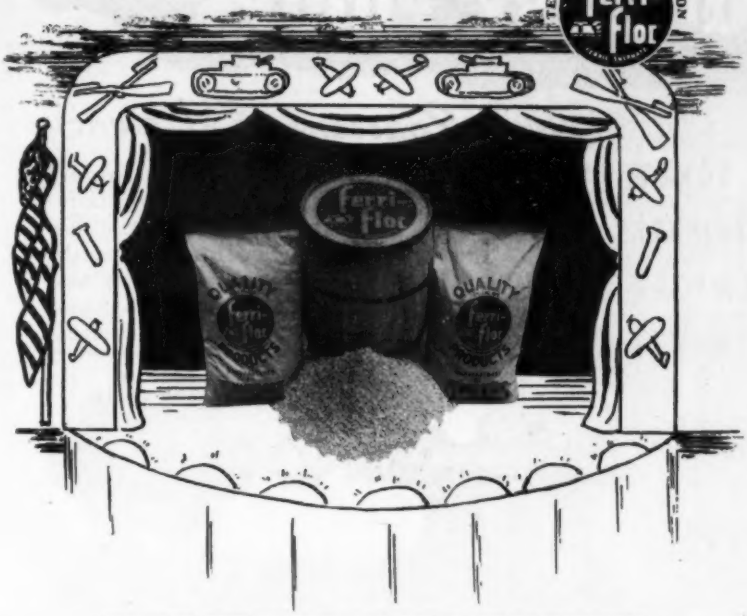
Positive Protection Against Dangerous Backflow may be obtained by the use of the Clayton Backflow Protection Units, according to A. I. A. File No. 29-D-35 of the Clayton Manufacturing Co., Alhambra, Calif. Pointing out that contaminated backflow endangers public health and that ordinary devices for preventing backflow of water from consumers' property to the public water system cannot be depended upon, this bulletin discusses the causes of backflow and the development of the Clayton backflow protection unit as a practical solution for positive protection.

Basic elements in the backflow protection unit are Clayton valves, the operation of which is also described in the bulletin. Engineering data and construction details are also included, as are the purpose, service, installation, approval, and features of both Units No. 10 and No. 15. The Clayton Pressure Differential Valve No. 20 and the Vacuum Breaker Valve No. 30 are also shown and described. Write to the Clayton Manufacturing Co., Alhambra, Calif., for this catalog or further information on the application of these backflow protection units.

The Preload System of crackless concrete construction as pioneered by the Preload Co. of Long Island City, N. Y., is described in a bulletin recently released by that company. Preload designs save up to 50 per cent of the amount of steel required in the construction of normal reinforced concrete. This "system of reinforced concrete construction involves a different relation between steel and concrete. In the case of a tank, steel bands are tensioned around a concrete shell similarly to their use in wood stave construction. The tensioning of the bands compresses the concrete as wood staves are compressed. Filling the tank elongates the shell and slightly increases the tension of the bands." The result is that the compression is released instead of the concrete being tensioned in conjunction with the steel. "Without tension the concrete does not crack. Liquid tightness and permanence are thus accomplished." This type of construction has been successfully used in water tanks. Further information may be obtained from the Preload Co., Inc., 4738 Fifth St., Long Island City, N. Y.

They Save With Ferri-Floc

TENNESSEE CORPORATION



IN THE THEATRES OF WAR PRODUCTION

FERRI-FLOC

Saves Money — Saves Man-Hours

Through the efficient part it plays in the manufacture of:

Shell-Casings — Synthetic Rubber

Foam Fire-Fighters for use aboard ships — Insulating Board for ships and barracks

Mineral Pigments for paint and camouflage

Through its important role in:

Boiler Feed-Water Treatment in War Plants
Water Purification in Army, Naval and Air Bases
Sewage Treatment in Army, Naval and Air Base

Yet to all users on the HOME-FRONT, FERRI-FLOC is still available without priorities.

ARMY E NAVY

We salute Tennessee Copper Company, source of our raw materials, for their untiring efforts which have permitted our other plants to carry on at full capacity; and we share their pride in their recent award of the Army and Navy E.

TENNESSEE CORPORATION

ATLANTA, GEORGIA — LOCKLAND, OHIO

Combined

SEWER & PIPE FINDER

and

AMPLIFYING RECEIVING COIL

THE U. S. GOVERNMENT BUYS THEM

Send for Circular

Frank N. Blake, North Adams, Mass.

BAILEY METERS AND CONTROLLERS

FOR SEWAGE TREATMENT AND WATER SUPPLY . . .

● Venturi Tubes, Weirs, Flumes, Nozzles and other primary elements; Mechanically and Electrically operated Registers and Complete Automatic Control Systems.

BAILEY METER COMPANY

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Bailey Meter Co. Ltd., Montreal, Canada

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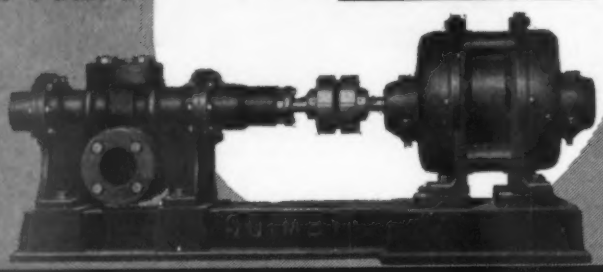
Constant Efficiency

SCREW PUMPS
CENTRIFUGAL PUMPS
CHEMICAL PUMPS
ROTEX PUMPS

No metal-to-metal contact except at bearings and driving gears. Clearance between impeller elements, and between impellers and casing, eliminates wear and insures *constant efficiency.*



PORTER Better Built Equipment

QUIMBY PUMP COMPANY
INCORPORATED

Division of H. K. PORTER COMPANY, Inc.
GENERAL OFFICES: PITTSBURGH (1), PENNSYLVANIA
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STEWART SEWER CLEANING EQUIPMENT
MACHINES LEASED OR SOLD

★ WOODEN & STEEL SEWER RODS • STEEL TAPES ★

★ ROOT CUTTERS • SEWER CLEANING BUCKETS • CABLE ★

JUMBO NO. 10 HEAVY DUTY WOOD RODS

Made of Selected Hickory with strong Malleable Iron Couplings, in 2½, 3, 3½ and 4 ft. lengths. Triple Lock, impossible to buckle or uncouple in the sewer. The tongue and groove feature eliminates wear on hook, increasing the length of service.

FREE TRIAL — THE RODS MUST PAY FOR THEMSELVES

Write today for Complete Catalog

MANUFACTURING SEWER CLEANING EQUIPMENT SINCE 1901

★ ★ ★ W. H. STEWART ★ ★ ★

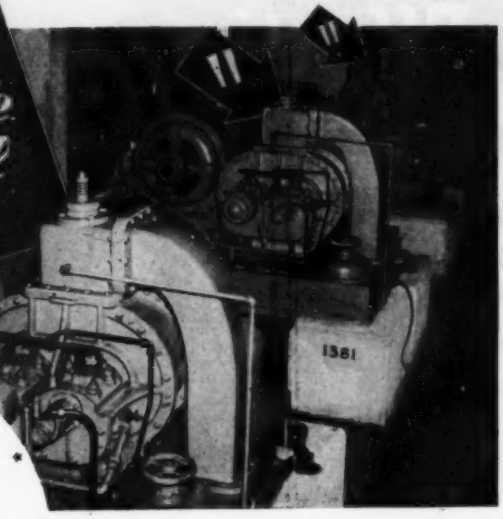
P.O.B. 767 • Syracuse, N. Y.

The Var-I-Feeder is presented in the new eight-page Bulletin No. 77 of Chem-Feeds-Inc. of Providence, R. I. This novel chemical feeder has been designed to further compact the apparatus, make its operation more convenient, improve the method of control, and reduce the cost without sacrifice of quality or dependability. A series of twenty figures show the portability, installation, drive, parts, transparent head, control, and blueprint of the apparatus. Bringing chemical feed control the simplicity of radio dialing, the Var-I-Feeder embodies these innovations according to the bulletin: High speed and midget size, right-side-up reagent head, finger-tip control of speed and feed while in motion, illuminated instrument type control panel, short stroke, small piston size and long life, correct check valve design, transparent illuminated reagent head, compactness drives from any motive power, and precision works with protective case.

Various chemicals can be handled by this machine, including dilute acids, hypochlorites, hexametaphosphates, alum, ferric chloride, and soda ash. These units can be supplied in twin and triplet models for feeding of multiple chemicals. Bulletin No. 77 may be obtained from Chem-Feeds-Inc., 77 Reservoir Ave., Providence, R. I.

Wedge-Bar Screens, the profile bar screen with the continuous slots, have many varied uses, according to an 8-page catalog of the Wedge-Bar Screen Corp. of New York. In addition to being used in many types of manufacturing plants, these screens may also be used in water filtration and sewage treatment plants. The catalog shows the open-back type screen, those with reinforcing inserts, as well as screen framing and fixation. For greater efficiency the screen is designed with continuous slots and no non-perforated areas. The profile bar feature produces a slot which enlarges downward, thus permitting moisture and undersize material to clear quickly without binding or packing. Profiles are made in different sections and sizes for different applications. Information on the Wedge-Bar Screen and data sheets for convenience in supplying information to the company as a basis for submitting recommendations may be obtained from the Wedge-Bar Screen Corp., 145 Hudson St., New York, N. Y.

ASSURING an Adequate Supply of AIR



PLANT IMPROVEMENTS

PLAN NOW—TO SAVE TIME, LATER. Even though war restrictions may defer your procurement of new blowers, we will be glad to help you work out the details of your needs now—for future action. Write for bulletin.

Three heavy-duty Roots-Connersville Positive Displacement Blowers provide economical and effective aeration in the sewage treatment plant at Peru, Indiana. Two are V-belt driven from electric motors, and one is direct connected to gas engine. Capacity of each, 800 c.f.m.; pressure 8½ lbs.

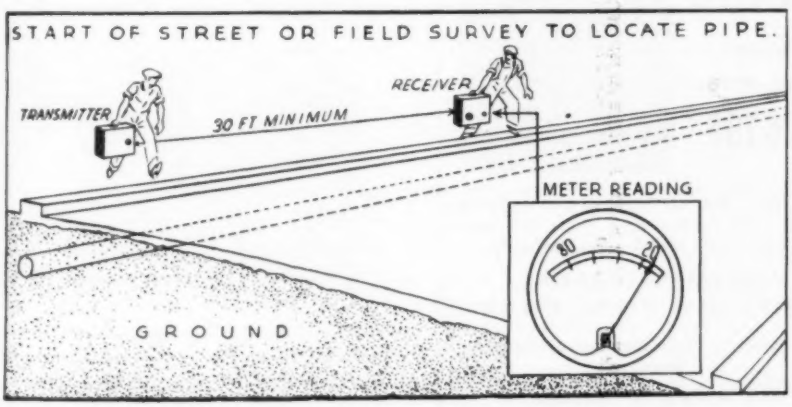
ROOTS-CONNERSVILLE BLOWER CORP.
310 Mount Ave. Connersville, Indiana

Roots CONNERSVILLE SINCE 1854 — Aerating BLOWERS

M-SCOPE

BURIED PIPE AND CABLE FINDER

How to Find a Buried Pipe Line:



If a metal object lies between the transmitter and the receiver unit, the sound heard in the earphone will be louder and the meter reading higher.

** Watch for other uses in this series of advertisements.*

FISHER RESEARCH LABORATORY

Direct Teletype by Postal Telegraph PALO ALTO, CALIF.

· 1879 ·

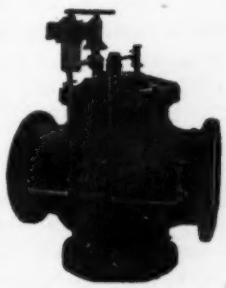
ROSS AUTOMATIC VALVES

ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES

FLOAT VALVES • REDUCING AND REGULATING VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.

COMBINATION VALVE
Combination automatic control both directions through the valve.
A self-contained unit, with three or more automatic controls.



REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.

Economical-Effective Durable

SERVICISED
SEWER PIPE JOINTING
COMPOUNDS

HOT POURED COMPOUND

Servicised Sewer Pipe Jointing Materials have served in the sewerage field through many years.

Our Hot Poured Compound is specially prepared for vitrified clay pipe used in sanitary sewerages.

Servicised Hot Poured Compound is quick setting and produces tough, flexible, long lasting joint connections. This material is shipped in Fiber Drum Containers that open very easily.

TUFFLEX . . . is a cold premixed troweling plastic material that is also widely used in jointing of vitrified clay pipe.

TUFFLEX is especially outstanding for use in wet trenches because the material will set under water, thereby assuring continuous pipe jointing.

The adhesive and cohesive qualities of this excellent compound are resultful in a highly waterproof and root repelling product.

Save time and labor cost by speeding up sewer pipe jointing with TUFFLEX. This material arrives on the job for immediate use.

Millions of pounds of Servicised Sewer Pipe Jointing Materials have been used throughout the country on Federal and Municipal Projects.

Pioneers in the Manufacture of Approved Construction Materials for Over 23 Years
SAMPLES AND DESCRIPTIVE LITERATURE WILL BE SENT UPON REQUEST

SERVICISED PRODUCTS CORP.
6051 West 65th Street, Chicago, Ill.

HYDRO-TITE

HYDRO-TITE — The self-caulking joint compound that makes cast iron water pipe joints — strong — tight — flexible and everlasting. Used on thousands of miles of pipe with a record of more than 30 years without a failure.

•

FIBREX — The sanitary paper packing that is used like braided jute. Free from bacteria — treated with a water repellent — put up in 60 pound reels. 70 pounds of Fibrex takes the place of 100 pounds of braided jute.

•

HYDRAULIC DEVELOPMENT CORPORATION
50 Church St.
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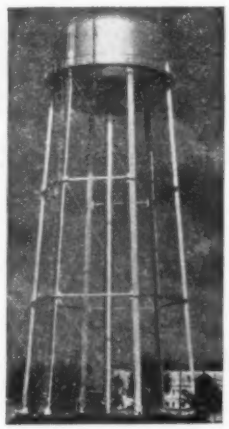
DRY BRAIDED
Fibrex

RUST RUINS STEEL TANKS

PROTECT THEM WITH
"RUSTOP"



"RUSTOP" the Cathodic System Immediately and Permanently Stops Corrosion on Submerged Metals—Economically.

CLEANS OLD TANKS
KEEPS NEW TANKS CLEAN

No Scraping, Sandblasting or Painting Required

THE APPROVED METHOD

RUSTOP
THE CATHODIC SYSTEM
OF
CORROSION PREVENTION

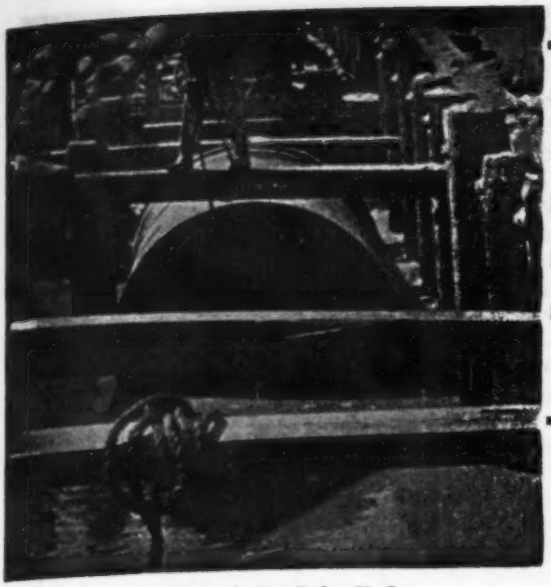
ELECTRO RUST-PROOFING CORP.
DAYTON • OHIO

Diesels for Profitable Power is a new publication of the Fairbanks, Morse Co. of Chicago. This bulletin, 3000A, includes a brief history of the company's background, together with particulars on design, manufacture and service facilities for marine and stationary Diesels. Included with the bulletin is a loose-leaf supplement sheet giving detailed operating cost data for typical municipal plants. These Diesel power installations have found wide application in small municipal light and water plants. Bulletin 3000A is available to any person having a power problem. It will be sent on request to the Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

Rotary Distributors is the title of Bulletin 257 of the American Well Works of Aurora, Ill. Photographs and descriptive matter present the various features and advantages of the equipment, including the oil seal, positive drive center column (for large and small beds), collector rings, and continuous spreader plate. Also described are the American Reaction Distributors, the Hydrodrive Distributor, dosing siphons, and the Freevent underdrains. Bulletin No. 257 is one of a series* that may be obtained from the American Well Works, Aurora, Ill.

(*Earlier bulletins of this series, covering the diverse line of American water and sewage equipment, were reviewed in this column of our August issue.)

Floatless Level Control is the title of Sheet 1100 of Photoswitch, Inc., of Cambridge, Mass. This sheet describes the application of electronic relays to the control of liquid levels in tanks. Types are provided for single level indication and control, on and off pump control at two levels, boiler feed water control. Installation merely requires attaching the probe fitting to the surface of the tank. The equipment has no mechanical parts, has unlimited life and is effective in replacing more complicated float switches. Even when used with non-conductive fluids the control carries only microamperes of current and low voltage. For this reason it is especially suited for use with combustibles. The type of control offered for level controls of conductive materials, including water, should be adaptable to use in a sewage plant or pumping station. Further information on



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.

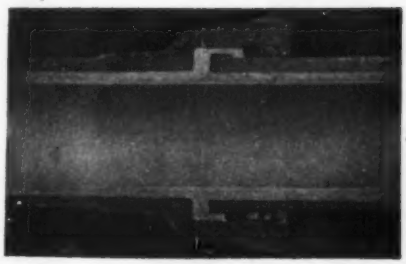
11 Broadway, New York

Warren Pipe Company of Mass., Inc.

75 Federal St., Boston

View showing Tate Process in Pipe Joint. Note thoroughness of Lining.

Help Save Critical Materials · investigate TATE Cement Lining Process



With the increase in demand for Critical Materials in the Water Works field *now* is the time to investigate the Tate Cement Lining process—and see what it can do to restore the efficiency of your old water mains.

THE TATE PROCESS ACCOMPLISHES

1. Water mains cleaned and cement-lined without removing pipe.
2. Eliminates discoloration and further cleaning costs.
3. Reduces pumping costs.
4. Restores reduction in head and flow co-efficients. This means full fire protection and lowered insurance rates.
5. All Joints cement-lined . . . eliminates bacteria in joints.
6. Does the job with minimum interruption of service to consumer.

Write for Literature

TATE PIPE LININGS, Inc.

ANDOVER, MASS.

LAKESIDE NEW CENTRIFUGAL NOZZLE FOR AERO-FILTERS

Lakeside's new centrifugal nozzle consists of two pieces, body and cover. These are designed so that all threads for attaching cover to body are eliminated. It is only necessary to set the cover on the body outlet and give it a slight turn to the left to lock it in place.

• • •

The cover is also designed to prevent plugging of the orifice by matches and other accumulated material.

• • •

Let us cooperate with you in the design of your sewage plant for post-war construction. Aero-filter plants have lowest initial and operating cost.

• • •

Write for bulletin

LAKESIDE ENGINEERING CORPORATION

222 W. Adams St. Chicago, Ill.

P. F. T. Flame Traps protect the sewage treatment plants of over 200 war projects

In camps and armament plants throughout the nation, the fire and explosion hazards created by sewage gas at the disposal plants are eliminated by P.F.T. Flame Traps, P.F.T. Boiler Room Equipment is preferred.

Write for Bulletin No. 121-A describing P.F.T. Flame Traps, Pressure Relief Valves, Waste Gas Burners, Condensate Drip Traps, Pressure Gages and other boiler room accessories which assure sage operation of digested sewage sludge treatment plants.

P.F.T. PACIFIC FLUSH-TANK COMPANY
4241 Ravenswood Ave., Chicago, Ill.
New York Charlotte, N. C.

INSTALLATIONS WORLD WIDE

LARGEST CITY TO SMALLEST VILLAGE

VALVES COMPLETE EQUIPMENT FOR WATER WORKS FILTRATION AND SEWAGE DISPOSAL PLANTS LATEST "COREY TYPE" HYDRANTS

Write for Catalogue and Information

IOWA VALVE CO.

General Offices:
Hubbell Bldg., Des Moines, Iowa

Plant:
Oskaloosa, Iowa

these Floatless Level Controls may be obtained from Photoswitch, Inc., Cambridge, Mass.

The Blake Combined Sewer and Water Pipe Locator was originally described in our Equipment News Section about a year and a half ago. A copy of the most recently revised small folder describing this instrument has come to our desk reminding us again of the usefulness of the equipment. Lest some of our readers may not have seen the previous announcement or have forgotten it, we mention it again, reminding all those who are interested in finding buried sewers or water pipes as a part of the preparation necessary for "Blueprinting Now" that this instrument is now available at a lower cost and will do the work heretofore requiring two pieces of equipment. For the descriptive folder, which also quotes prices of this novel sewer and water pipe locator, address inquiries to the inventor, Frank N. Blake, North Adams, Mass.

New Ideal Maintenance Handbook of the Ideal Commutator Dresser Co. tells how to keep motors and generators operating at peak efficiency without dismantling. The book also contains illustrations and descriptions of Ideal equipment such as electrical equipment, variable speed transmissions, machine tool accessories, wiring devices and tools, and rechargeable batteries for flashlights. This Handbook No. 143 on Maintenance may be obtained by writing to the Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Ill.

Variable Volume Hydraulic Pumps and hydraulic valves are described in Bulletin P-11-C of the Racine Tool & Machine Co., Racine, Wis. Photographs and installation circuits are shown of two-pressure controls, the variable volume hydraulic pumps and the hydraulic valves. A partial list of the uses of this equipment is given and exclusive features of the equipment described. Bulletin P-11-C may be obtained by writing the Racine Tool & Machine Co., Racine, Wis.

Iron Case Cold Water Meters built in accordance with W. P. B. Limitation Order are listed and described in Bulletin No. W-539 of the Pittsburgh Equitable Meter Co. of Pittsburgh, Pa. Six different types of meters are shown with available sizes ranging from ⅝ in. to 12 in. Copies of this bulletin, No. W-539, or additional information may be obtained by addressing the Pittsburgh Equitable Meter Co., 400 N. Lexington Ave., Pittsburgh, Pa.

INQUIRIES INVITED on all Problems of WATER TREATMENT

Whether your problem of water rectification is large or small, we have a form of equipment to serve your needs. We manufacture and install equipment for Gravity Filtration and Softening Plants; Pressure Filters and Zeolite Softeners; Swimming Pool Recirculating Appliances; and Water Treatment Units of all types.

ROBERTS FILTER MFG. CO.
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VOGT BROTHERS TRAFFIC MODEL FIRE HYDRANT

A.W.W.A.

VOGT BROTHERS MFG. CO. Incorporated LOUISVILLE, KY.
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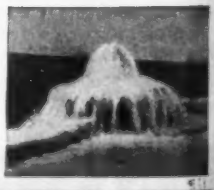
VOGT MFG. CO., Incorporated
P. O. BOX 1122 LOUISVILLE, KY.

AERO-MIX AERATOR—MIXER

A Size and Type to Fit Your Problem in Water or Sewage Treatment.

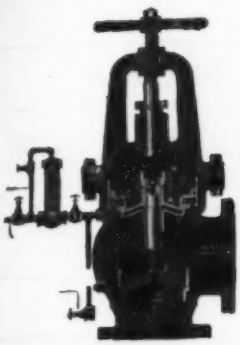


WRITE FOR INFORMATION

Triple-Acting Non-Return Valve

This valve will automatically cut in a boiler whenever its pressure equals line-header pressure; it will isolate a boiler automatically whenever its pressure, from any cause, is lower than line-header pressure; and it will prevent steam flow from the boiler in event of sudden drop of line-header pressure below the boiler pressure, by means of differential shot pilot valve functioning.

Write for specifications.



Furnished in angle, globe and elbow patterns, sizes 2½" to 12"; also available in larger sizes, as well as in the Cross pattern.

GOLDEN-ANDERSON VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

A Welder's Vest Pocket Guide has been prepared by the Hobart Brothers Co. of Troy, Ohio. Its pictures clearly show and explain what is wrong with different types of faulty welds and how to correct these faults. It suggests and illustrates all kinds of joints, fillet welds, and how to cut electrode waste, and explains the Three Essentials of Proper Welding Procedure. Also included are a Trouble Check Chart on welding machine troubles, and a handy reference information on decimal equivalents. This handy book will be sent free to all welders writing to The Hobart Brothers Co., Troy, Ohio.

Chemical Treatment of Boiler Water by John D. Betz is Technical Paper No. 84 of the W. H. and L. D. Betz Co. of Philadelphia. This paper deals with the causes of boiler scale, corrosion, carryover, and embrittlement, as well as applications of commercial chemicals for the corrections of these difficulties. Technical Paper No. 85 on **Chemical Treatment of Cooling Water** by W. A. Tanzola is a companion article on a study of problems encountered in cooling water systems. These reprints will be furnished on request to W. H. and L. D. Betz, Gillingham and Worth Sts. (Frankford), Philadelphia, Pa.

LEADITE

The Pioneer Self-Caulking Material for C. I. Pipe

Thousands of miles of C. I. bell & spigot Water Mains are *satisfactorily* Jointed with LEADITE

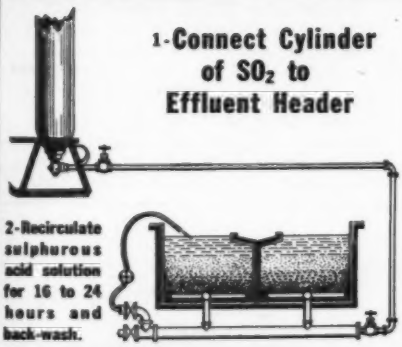
. . . more miles of c.i. bell and spigot water mains are jointed with LEADITE than with any other melted self-caulking material.

LEADITE melts easily, flows around the joint freely, saves time, labor and cost of material . . . and makes a good, tight joint that improves with age.

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

How To Clean Sand Filters in 24 Hours



3-RESULT: Clear, white sand and gravel; time, labor and money saved.

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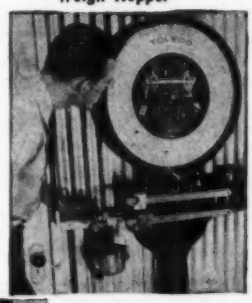
WEST NORFOLK, VIRGINIA

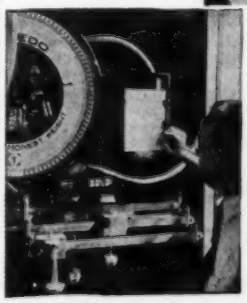
[SC]² PRECISION CONCRETE CONTROL

IMPROVES QUALITY REDUCES COST

Attaches to your Weigh Hopper

Moisture Meter
The only unit capable of determining moisture content in ONE minute.





Compensator
Delivers correct DRY weight of aggregates and ADDED water. Makes a graph record of EVERY BATCH.

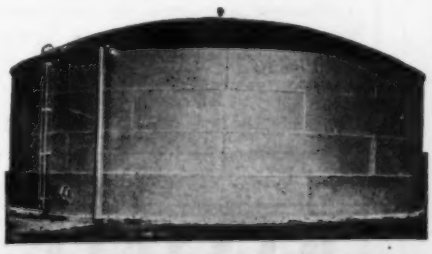
[SC]² CONTROL has been used on a number of important dams and sewer projects. It produces uniform, dependable concrete and is always approved by concrete engineers. Write today for full information.

SCIENTIFIC CONCRETE SERVICE CORP.
McLachlen Bldg., Washington, D. C.

PITTSBURGH • DES MOINES

Steel RESERVOIRS

P-DM Steel Reservoirs and Standpipes provide greatest economy in water storage—are permanently water-tight, may be erected at any time of year, and for maintenance require but a periodic coat of paint. All types and sizes up to 4,000,000 gallons. Bulletin No. 102.



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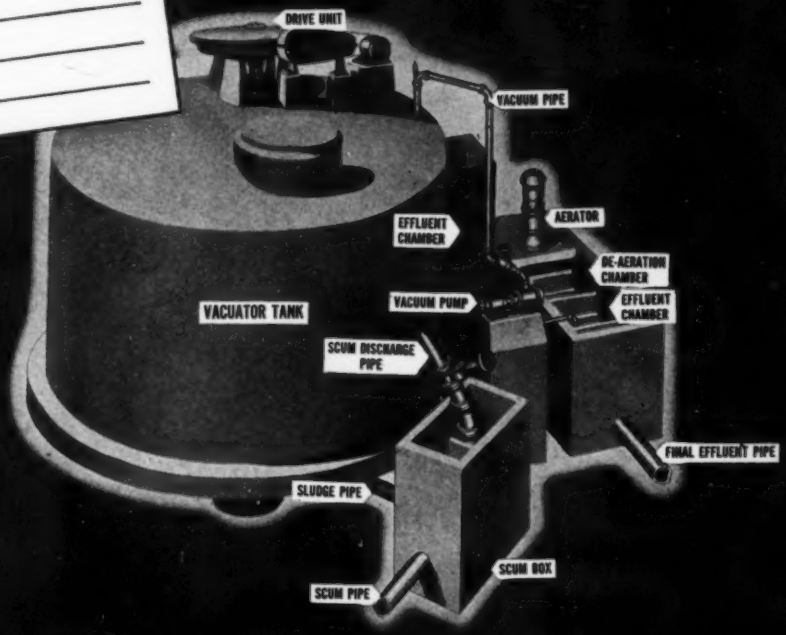

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